



WAGES OF SUBWAY MOTORMEN.

Announcement is made, at the time we go to press, that the threatened strike of employees on the elevated roads in New York has been averted by a concession on the part of the Interborough Company of practically all that was asked. The company had a full force of strike breakers on hand, under the leadership of James Farley, and the police reserves were all kept on duty; as one of the daily papers expressed it, the management held all the trump cards, yet it did not play them.

The situation, in brief, is that the Brotherhood of Locomotive Engineers demanded that the motormen on the Interborough Rapid Transit Subway receive \$3.50 for a day of nine hours, when the subway is opened, instead of \$3 for a day of 10 hours, as offered by the management. By the terms of the concession, the day will be 10 hours, but \$3.50 will be paid. It will be recollected that the payment of \$3.50 a day to the motormen on the elevated road was fixed as an act of special courtesy, out of consideration for the old employees, at the time that the change in motive power from steam to electricity was made. The former engineers were kept in employment and were paid a steam engineer's pay, although the service which they performed could have been duplicated by the company at a considerably lower figure. The work of a motorman is so much simpler than the work of a locomotive engineer that the prevailing wage scale is much lower; but the elevated road desired to retain its employees, partly in recognition of their long service and partly, no doubt, because they were a thoroughly steady and reliable set of men. Running trains on the elevated road, with the throngs of passengers that are carried during the rush hours and the short headway of trains is responsible work, although the moderate speed compared with that on ordinary railroads, and the constant inspection of the short lines, together with the entire freedom from danger resulting from washouts, freight wrecks or grade crossings, greatly reduces the element of risk.

Responsibility usually commands its own wage, as well as skill, and that is the chief reason which General Manager Bryan gives for the attitude of the company. He is quoted as saying:

If accidents had occurred to the subway trains the cry might have been raised against the company that we were employing cheap men. That is one reason that consent to the \$3.50 rate was given. Then again, it was arranged that the agreement should be binding for three years. That insures the company against labor troubles in the operation of the subway trains for that time at least.

Just how much should be paid for responsibility is hard to determine, and, like most similar questions, is best answered by a trial to determine what genuine efficiency can be bought for. If subway motormen can be hired for \$3.50 who are so much superior in character, in steadiness and in intelligence to the men who can be hired for \$3 that the safety of the traveling public is actively increased thereby, the higher price is none too much to pay for this efficiency; but if, as

seems highly probable, the Interborough management could have secured men entirely qualified for the work at \$3, the citizens of New York will have nothing to gain from the payment of the higher price, and the Interborough Company will have much to lose.

The Brotherhood of Locomotive Engineers has an admirable reputation as an intelligent and conservative body, and it has been marked for many years by the absence of the hoodlum element which clamorously determines the policy of so many unions against better counsel. In view of this, the threat of a strike by the elevated motormen, who have been receiving far higher pay than that given to any other motormen in the world as a recompense for reliability and loyal service, and who surely have no grievance, was evidently a test case to determine a principle.

With the recent great developments in the use of electricity, and the certainty that in a few years' time motormen, and not locomotive engineers, will handle most of the short haul traffic around New York and elsewhere, the Brotherhood of Locomotive Engineers naturally wished to stand firm on the principle that responsibility, as much as skill, should form the basis of the motorman's pay. However true this may be in theory, we feel strongly that the question will ultimately be settled purely on economic grounds, and that the ultimate rate of wages will be neither less nor materially greater than the amount which will serve to get and keep the services of thoroughly qualified men. For the present, the rather weak-kneed action of the Interborough Company, hampered, perhaps, by political affiliations, has really settled nothing, except that the subway must be worked for the next three years on a needlessly high wage scale.

STANDARD SPECIFICATIONS FOR TESTING MATERIALS.

The first step towards the adoption of international standard specifications is the use of standard test pieces, in order that the results may be comparable. The tension test pieces proposed by the Engineering Standard Committee of England will no doubt come into general use, as they seem to be a practical solution of this troublesome problem. It is to be hoped that a series of tests will be made here on universal plates, shapes and eye-bar flats, using test pieces of 1½ in., 2 in. and 2½ in. in width for different thicknesses of material, in order to bring out the effect of varying widths on the percentage of elongation, when tests are made under the conditions in use in this country. One set of tests should be made with the slowest pulling speed in use, and another with the fastest speed of the testing machines in ordinary practice. This no doubt would repeat to a certain extent, the recent tests made by Prof. Unwin, but it would give some very valuable information. It might show that it would be desirable to embody in the specifications a clause to regulate the pulling speed, in order to keep all the conditions under which tests are made a little more uniform than they are at this time.

The next step, of course, is to decide on the best form of test piece for the thick eye-bar flats, say 1¾ in. and over in thickness, in order that results may be nearer those of

the full size tension tests of the finished eye-bars. Other things being equal, the larger the test piece the more reliable the results; but if square test pieces equal to the thickness of bar are used, the ordinary testing machines are not large enough to pull them. The thin slice cut from the bar with the width equal to the thickness of the bar does not give satisfactory results, but it is often used. Recourse is had to the round test piece for these heavy bars, and the results of these tests are not all that could be desired. This heavy material gives more trouble than any other, and it seems as though this would be a good time to take up and thoroughly investigate the forms of test pieces best suited to give the most reliable results. In England, of course, they were not bothered with this, as they do not use upset eye-bars, while in this country it is a matter of vital importance, as the size of eye-bars increases every year.

Standard test pieces for bending have been considered by some of the committees at work on specifications, and they have generally decided on the following: "Full sized material for eye-bars and other material one inch thick and over, tested as rolled, shall bend cold 180 degrees around a pin the diameter of which is equal to twice the thickness of the bar without fracture on outside of bend." This bending test is considered by many engineers to be a much better check on brittle steel than the ordinary tension tests.

In all the present specifications allowances are made in the percentage of elongation and the requirements in the bending tests for the heavy material. They are not as severe as for steel of medium thickness, and it is an open question if engineers have not gone too far in these allowances. In other words, if much better heavy material cannot be rolled than that supplied in ordinary every day practice under the present specifications. This applies to rails as well as to any other heavy rolled material, and it opens up one of the most important questions to both the engineer and the manufacturer. It is a matter that depends largely on the amount of work in rolling put on the steel at a low heat, and the low finishing temperature in rolling. If this could be done without any additional cost, it would be a very simple matter to settle; but as it involves cutting down the daily tonnage with a corresponding increase of cost, the question comes up as to who is to pay for this. Some specifications are in use that cover this important matter of finishing temperature directly, and others cover it by increasing the requirements of the physical tests, which in turn require a much lower finishing temperature. As the importance of this becomes more generally understood these tests will come into more general use, which will result in better steel for the consumer at perhaps a slight increase in cost.

As long as train orders on which depend life and death are to be habitually written on thin paper, with lead pencils, and are to be read by the light of dim lanterns, in all kinds of weather, the duty of taking the utmost pains with the penmanship and the form of words and all other details is obvious; but agreement on just what ought to be done in particular cases is often difficult. Concerning a subject mentioned in these col-

umns recently (August 5, page 207) a correspondent in Georgia writes:

As, according to the accident bulletins, train orders containing references to the second section of a train are peculiarly liable to be misread, the following suggestion is offered: Let all regular trains be numbered from 1 to 100. If it be desired to run a second section, of freight train No. 90, instead of designating it in train orders as "Second (2d) 90," let it be identified as 290; if a third section, 390, etc., indefinitely. Limited express No. 3 should be followed by train No. 303, 403, etc. Such a method of numbering gives a train more individuality than to bury it under such a designation as "Second (2d)," particularly when such a designation so often results in the necessity for the burial of part of the passengers and crew.

Makers of time-tables would object to any scheme limiting their train numbers to 100. On many time-tables Numbers 290, 303, etc., are already in use for regular schedules. But we should be inclined to reject our correspondent's suggestion for another reason; the reason that as a rule railroad officers will refuse to accept innovations in rules unless they are very marked improvements. Probably this attitude on their part is, on the whole, a good thing, as even a meritorious change, if adopted by only a part of the railroads, helps to break down the uniformity which the railroads have been laboring for these many years to secure. The suggestion of Mr. Forman in our issue of August 19, page 252, that the word "section" be inserted in orders, seems to us a sensible remedy for the danger referred to; but we print the communication quoted above in order to take occasion to say that the real trouble undoubtedly is, as Mr. Forman points out, the neglect of the simple precaution of checking one person's reading by another's. There does not appear to be much evidence that the rule requiring firemen and brakemen to read orders has ever done an appreciable amount of good. If collisions due to forgetfulness are any less frequent than they were ten years ago nobody seems able to demonstrate the fact. A conductor or engineman who, by reading orders to a third party, is saved from committing a costly blunder, is quite unlikely to tell of the circumstance. But the checking of each other's reading by the two principals, the conductor and the enginemen, was never as a rule enforced as it ought to be. To try to make reading by subordinates take the place of more careful reading by the principals, was, probably, misdirected effort. In many cases the brakeman or fireman would be of doubtful competency as a corrector of his superior's errors. Having orders read by four or more men is following the rule not to put all your eggs in one basket. Quite likely it would be profitable to give attention to the other man's rule—Put your eggs all in one basket, and watch that basket. While the use of the word "section" may cure one class of errors, there will still remain to be cured other difficulties in reading.

The increasingly frequent collisions of street cars and locomotives at crossings are giving our numerous foreign visitors a striking illustration of American energy, and the most recent one, at St. Louis, last Saturday, killing six passengers and injuring 19 of the remaining 22, was almost within sight of the World's Fair grounds, where we exhibit other American inventions. This case appears to have been accompanied by all the reprehensible or unfortunate circumstances that could be crowded together. The car conductor was experienced, but his practice has long been loose. He stopped his car and ran ahead,

but apparently depended on one of the two crossing watchmen instead of his own eyes, for the locomotive was within a few hundred feet. There were gates on one side of the railroad, but these had been out of use several months. The second watchman seems to have been intended as a substitute for the gates, but the two together apparently were not equal to one good one. The habitually moderate speed of the steam engine appears to have tempted both the watchmen and the street car men to take risks. The locomotive enginemen declare that the trolley car stopped before the engine struck it. We have rehearsed these bits of evidence from the coroner's hearing, not because they explain the collision, for they are confusing and do not explain, but to emphasize once more that with grade crossings there is no safety but in complete interlocking. A carriage is measurably safe on a crossing, and its safety is partly due to the ease with which its occupants can jump out in an emergency. The horse cars were somewhat like a carriage in this respect, but with the modern large and heavy electric car we have gone beyond the limit. The duty of requiring interlocking, however, rests primarily on municipal authorities, and they usually lack the necessary courage and intelligence. The steam railroad naturally objects to having its business unfairly interfered with, and this seems to encourage city officials to take counsel of their timidity. The result is that a hundred pressing problems like that at St. Louis remain indefinitely under a cloud of neglect and uncertainty. The only certain thing about them is that fatalities will not only continue, but will increase if the right remedy is not applied.

Proposed High-Speed Electric Line Between Berlin and Hamburg.

The two great German electrical companies which provided equipment for the high speeds attained on the Berlin & Zossen Military Railroad (the General Electric and Siemens & Halske), have presented plans for a high-speed electric line to be built and operated between Berlin and Hamburg. Berlin in 1900 had 1,888,000 inhabitants, Hamburg 706,000, and both are growing rapidly. The length of the existing railroad between them is 177 miles, the air-line distance about 155 miles. The intervening country is flat and sandy, and there is no considerable city in it. There are now 10 trains each way daily between the two places, the fastest of which covers the distance in 3 hours and 27 minutes, and there are four trains which run to Hamburg in less than four hours. The number of through passengers daily now averages about 1,150, and it has of late increased about 10 per cent. yearly. About three-fifths of these passengers take third-class tickets, which cost \$3.24 one way, but only at the rate of \$4.25 for the round trip; and as return tickets are good for 45 days, few but emigrants take single tickets. The second-class tickets cost one-half more; the first-class, twice as much. For a seat in what is equivalent to our parlor car there is a further charge of 24 and 48 cents for the two classes admitted. Altogether the gross receipts from the through travel for the three classes is about \$3,420 per day, an average of a little less than \$3 per passenger. The economic problem to solve by a high-speed railroad is to win such an amount of travel at practicable rates to pay interest on its cost, plus the profit now made on the

existing railroad, allowance being made for the growth of travel and the avoidance of the capital expenditures which such growth may require on the existing railroad.

Siemens & Halske submit a design for a single-track line, everywhere separate from the steam railroads, except at the two terminal cities, by which great cost will be avoided. There would be but one intermediate station, where up and down trains would pass. The speed contemplated is not the highest attained and believed to be safe, but 160 kilometers (very nearly 100 miles) per hour, so that the journey would be made in 1 hour 55 minutes, if the crowded tracks at the termini do not cause delays. Owing to the single passing-point half-way, the number of trains would be limited to one every two hours, and there would be normally but one train at a time on a block about 85 miles long.

The other company's plan contemplates the double-track line with its own entrances and stations at the two termini, with no intermediate station, and a train despatched every half hour. The track would be of the present heavy Prussian pattern, 82-lb. rails on wooden ties in good broken stone ballast. The standard gage is adopted because of the necessity of transferring cars, but otherwise a wider gage would be preferred. The trailing cars should be of the Prussian modern through pattern on trucks, but six-wheeled trucks should be required.

As a matter of course, with trains running at such speeds, freight and ordinary passenger trains would be an element of danger and delay, as would be frequent switches, etc.

The rock on which these projects are likely to split is the economic one. The expenses can only be estimated from those of existing electric railroads at much lower speeds. The projectors estimate a cost of \$16,600,000 for the single-track and about \$29,000,000 for the double-track road, the latter to be increased by about \$3,500,000 to fit it for a speed of 124 miles an hour. To pay expenses and interest of about 4 per cent. it is proposed to charge 16 marks per passage (only one class), or \$3.81. As by far the larger number of passengers now pay but \$2.13, it is not believed possible that they would give \$1.68 more to save 1½ to 1¾ hours. The high-class travel between the two cities at present is too small to support such a line.

It would seem that the most favorable place in the world for speeds of this kind is between New York and Philadelphia, whose populations about double that of Berlin and Hamburg. But so long as the present river ferry is required at New York, high speed on the road is of less importance—at least it cannot make a really quick passage from house or place of business in one city to the other. With the tunnel completed it will be another story; but we should hardly expect 100 mile speeds inside of that structure.

The safeguarding of crossings of trolley and steam roads was discussed in these columns a year ago, after the Newark, N. J., crossing collision. That accident, it will be recalled, was caused by a trolley car sliding down a sharp grade and meeting a passing railroad train, with resultant loss of a number of lives. As asserted at that time, there is only one way to eliminate this class of accidents. Derailing switches and other protective agencies will lessen the chances for their occurrence, but the one sure safeguard is the separation of the grades. An accident somewhat similar to the one at Newark lately occurred in Chicago. A crowded "race-track special" on a trolley line, consisting of a motor car and two trailers, ran on a crossing ahead of a fast-moving railroad

train. Several passengers were killed and others were seriously injured. Impelled by this and similar accidents, of which there have been a number in the State lately, the Illinois Railroad & Warehouse Commission has cited officers of a large number of steam roads and traction lines to appear before it and show why all unprotected intersections of such roads should not be provided with interlocking devices. In addition to crossings in the State generally, particular attention will be given to protecting crossings of trolley and steam roads in Chicago. What means of protection for these city crossings the Commission will demand may have developed at the hearing, which was held this week, since this was written. The railroads within the limits of Chicago have, at the demand of the city, already done splendid work and have spent millions of dollars in elevating their tracks and eliminating street crossings, and therefore many trolley crossings. But this work is far from being completed and there are still many trolley crossings that are a constant menace to the safety of passengers. If the Commission succeeds in lessening the chance of accident at these until such time as they are all eliminated by elevation of the railroad tracks, it will have done commendable work. If, in addition, it succeeds in getting interlocked a considerable part of the 77 per cent. of grade crossings in towns and rural communities which its last report recorded as unprotected, it will deserve the gratitude not only of the State, but of the entire country, for the example set.

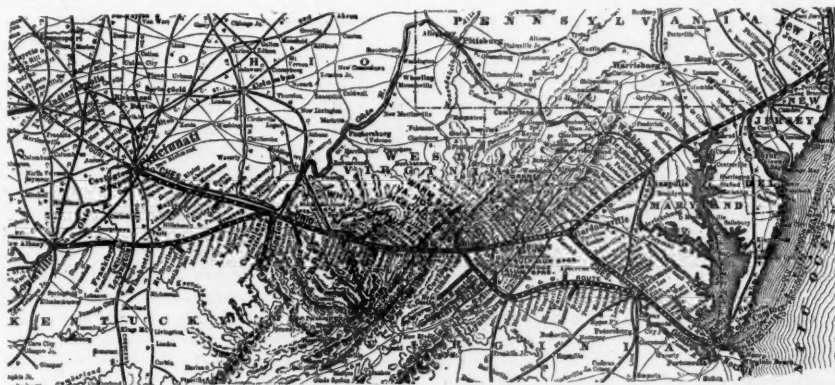
Chesapeake & Ohio.

The year ending June 30, 1904, was a prosperous one with large increases in gross freight earnings, due principally to the bituminous coal traffic, and also considerable increases in net; and the extension and second track work was carried on vigorously. These

Gross earnings for 1904 were \$19,297,525, as against \$16,711,602 last year. As comparing with this increase of \$2,585,923, operating expenses increased but \$1,730,467, leaving total net earnings of \$6,514,335, as against \$5,658,879 last year. These gains are on a mileage of 1,082, an increase of 144 miles, chiefly in branches in Virginia and West Virginia, over last year. Including lines operated through stock ownership and lease and trackage worked, the average total mileage of the year was 1,657, which is practically the same as last year's total mileage, owing to the fact that the increase in lines owned is chiefly balanced off by decreases in lines leased and operated through stock ownership. The following table, comparing operations in 1894 and in 1904, shows how greatly the business of the company has been developed during the last decade. It is worthy of note that the increase in gross for the current year, following on the strike year, is considerably greater than the increase of any other year in the decade.

	1904.	1894.
Freight earnings	\$14,869,188	\$6,630,201
Passenger earnings	3,648,233	2,011,977
Total earnings	19,297,525	9,044,108
Maintenance of way	2,307,620	1,183,564
Maintenance of equipment	3,659,382	1,203,835
Cond. transportation	6,420,666	3,123,821
Total expenses	12,783,190	5,724,975
Net earnings	6,514,335	3,319,133

The number of revenue freight cars in service, their tonnage capacity and the average capacity per car, is tabulated for a series of years beginning with 1890. At that time the average capacity of the 9,572 cars in service was 22.4 tons. It increased to 25.1 tons in 1904 and then remained nearly the same for several years; but the substantial increases began again in 1898, when 14,154 cars were in service, with an average capacity of 26.2 tons. At present there are 24,000 cars in service and their average capacity is 35.6 tons, quite a remarkable increase in six years of elapsed time. The Chesapeake & Ohio has for a long time made use of equip-



Chesapeake & Ohio.

extensions, in connection with the general betterment of the lines to qualify them to handle the heaviest class of traffic economically, are all being made with a view to further development of the coal traffic which has so continually increased in importance. It will be remembered that the Chesapeake & Ohio was originally a grain road, while at the present time products of agriculture only contribute about 6½ per cent. as their share of the local traffic, while coal contributes about 62½ per cent. The increase in bituminous coal traffic from 3,903,269 tons in 1903 to 6,095,025 tons in 1904 is, of course, chiefly to be attributed to the fact, noted last year, that the 1903 report followed so close after the coal strike in the West Virginia territory that the full movement had not been restored.

ment and car trust contracts quite freely, and the new equipment with its greater carrying capacity has been chiefly acquired in this way. On June 30, 1904, the aggregate amount due on these car trust and equipment contracts was \$6,940,110.

Capital stock was increased during the past year to \$62,799,400 by the issue of 22,605 shares of common stock issued in exchange for stock of the Maysville & Big Sandy railroad. The funded debt was increased to \$78,674,354 by the sale of \$3,239,000 general mortgage 4½ per cent. bonds and by the assumption of \$2,000,000 Green Brier Railway 4s in the acquirement of that property. Of the general mortgage bonds \$2,784,000 were applied for special construction and second track, and the balance used for purchase of additional Maysville & Big Sandy stock and

for the retirement of Green Brier and New River 5 per cent. bonds at par.

The following table shows the principal results of operation:

	1904.	1903.
Freight earnings	\$14,869,188	\$12,510,006
Passenger earnings	3,648,233	3,474,905
Gross earnings	19,297,525	16,711,602
Maintenance of way	2,307,620	2,178,835
Maintenance of equipment	3,659,382	2,679,021
Cond. transportation	6,420,666	5,839,230
Total expenses	12,783,190	11,052,723
Net earnings	6,514,335	5,658,879
Gross income	6,683,607	5,849,253
Interest on funded debt	3,674,796	3,559,949
Net income	1,944,511	*1,419,604

*For comparison, the principal of car trusts (\$150,000) has been separated from the interest payments, which accounts for the differences between these figures and those contained in the report for 1903.

From this current net income of \$1,944,511, payments aggregating \$450,000 were made on account of principal of car trusts; \$861,366 was appropriated for extraordinary expenditures for construction and new equipment, and \$627,904 was paid in dividends.

NEW PUBLICATIONS.

Technology of Paint and Varnish. By Alvah H. Sabin, Chemist for Edward Smith & Company, New York. 372 pages, 5½ x 9; illustrated. New York: John Wiley & Sons. London: Chapman & Hall Limited. Cloth, \$3.

In this rather unique work the writer has sought to give a correct general outline of the entire subject of paints and varnishes, with a brief account of their modern use and of the principles involved in their manufacture and application. As the author says in his preface, many of the facts noted, though, old, are practically unknown, and some of them exactly anticipate recently patented processes; their value to the public in that way is sufficient excuse for their republication. Starting with definitions, an outline early history of paint and varnish is narrated in a highly entertaining way, with free reference to the classics, as where a parallel translation of a formula for making varnish is given from Theophilus, together with the Latin. This is followed by a number of ancient formulas of considerable interest. Following the historical chapters is a thorough account of modern paint and varnish manufacture and application, which is technical and yet so written as to be at once intelligible and interesting to the layman.

Iron and Steel Works Directory. Compiled and published by the American Iron and Steel Association, 261 South Fourth street, Philadelphia, Pa. Sixteenth edition. Corrected to August 1, 1904. \$10.

The American Iron & Steel Association has issued a thorough revision of its well-known directory to the iron and steel works of the United States, bringing it up to August 1, 1904. This directory is the largest the Association has ever published, containing 484 pages 5½ x 8 in. The directory, like its predecessors, is careful and complete, and the works are indexed alphabetically and are also classified by States and districts and by products. The directory covers the same useful field with reference to iron and steel works that Poor's Manual does with reference to railroads, and it is a compact and valuable reference book, containing within its covers information which would have otherwise to be sought out from many sources.

TRADE CATALOGUES.

Abner Doble Company, San Francisco, Cal., issue as Bulletin No. 6 a thesis by H. C. Crowell and G. C. D. Lenth, of the Massachusetts Institute of Technology, entitled "An Investigation of the Doble Needle Regulating Nozzle." This nozzle is intended for

use under high heads of water for power purposes. The appearance of the stream issuing from the Doble nozzle, which was clear, transparent and polished, led to comparisons with streams issuing from various other nozzles, which had a feathery appearance. The conclusion was reached that the feathered appearance results from a difference in velocity in the particles of water, the velocity of the outer layer being decreased. The distribution of velocity in jets therefore formed a principal part of the thesis, the other and more important part of the work being a determination of the efficiency of the jets from the Doble nozzle. Data obtained from the experiments are exhibited in the form of curves and tables. There are also a number of engravings from photographs of different kinds of jets.

S. F. Bowser & Company, Fort Wayne, Ind., send several pamphlets devoted to their products. One of these is the Bowser self-measuring oil tank for merchants' and storehouse use. These tanks have an indicator showing stock on hand, an anti-drip nozzle, a discharge register registering each gallon pumped, and also a computer which will instantly and automatically show the money value of the oil withdrawn. The Bowser adjustable-measure oil cabinets, the subject of another pamphlet, are designed for the safe, economical and convenient storage of oil in factories, shops, power houses, mills, engine rooms, etc. They pump and measure the oil directly into the oil cans. Bowser gasoline outfits are claimed to provide a safe, convenient and economical method for handling gasoline for automobile stables, factories, shops, etc. An album of views of buildings and oil rooms equipped with Bowser oil tanks and cabinets contains a large number of half-tone engravings, and also shows views of ideal oil houses.

The International Steam Pump Company, New York City, are distributing a pamphlet descriptive of the pumping machinery at the St. Louis Exposition. Forty different types of these machines are shown, as well as air compressing and steam condensing apparatus, cooling towers, vacuum machines, water meters, etc. The processes in which these machines are employed on the Exposition grounds, such as timber preserving and refrigeration, are fully explained and diagrams and graphical charts are employed to illustrate the design and arrangement of apparatus. A view of the Grand Cascade is shown on the cover and the large Worthington turbine pumps by which the water is supplied are described in the text.

The Crocker-Wheeler Company, Ampere, N. J., sends a fac-simile of a photographic souvenir which was presented to each of the 45 members of the Associazione Elettrotecnica Italiana, who made a tour of inspection of the company's plant at Ampere. The souvenir is a photograph of a pretended page from the note book of one of the guests describing the visit.

The Norton Grinding Company, Worcester, Mass., is distributing its 1904 catalogue of plain cylindrical grinding machines. These machines are used for both straight and taper work. Illustrations and full detailed descriptions of the machines are given as well as illustrations of the work done and the method of doing the same.

The Chicago Union Pacific and North-Western Line issue a neat folder of California; it is profusely illustrated throughout with half-tones showing typical California

views. An extensive list of hotels at the different California tourists resorts are also given, including the rates both per day and week.

The Michigan Malleable Iron Company, Detroit, Mich., is distributing a booklet descriptive of Detroit issued by the "Convention Bureau." It is illustrated throughout with a number of half-tones, which show the principal buildings, parks, places of historic interest, etc.

The Draper Machine Tool Company, Worcester, Mass., issue a pamphlet descriptive of its new design of lathes. Illustrations and descriptions of these tools ranging from 18 in. to 28 in. are given. All of the tools described are fitted with the quick-change feeding device.

The Allis-Chalmers Company, Chicago, issue a finely executed catalogue bearing the title "The Book of the Four Powers." It is illustrated throughout with notable installations of steam, gas, water and electric power that have been installed by the company.

The Warner & Swasey Company, Cleveland, Ohio, sends its 1904 general catalogue. This illustrates and describes hollow hexagon turret lathes and screw machines as well as turret lathes for brass work and other brass working machine tools.

The Rust Boiler Company, Pittsburg, Pa., issues a catalogue descriptive of the Rust water tube boiler. A full detailed description and illustrations of the boiler is given.

CONTRIBUTIONS

Difficulty of Getting Promoted.

Sept. 5, 1904.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read with much interest the article in your issue of September 2 castigating the labor unions for the blighting effect that their rules have on the efficiency of the railroad service. Your strictures are well deserved, and everybody will agree with you as to the need of more common sense and independence among the leaders of the several brotherhoods. But the reader is, nevertheless, left with a painful sense of incompleteness; you have dealt with only half your subject. The ambitious and intelligent engineman or conductor ought, indeed, to break away from his overbearing chief, or his grievance-committee chairman, and put forth his best efforts to qualify himself to be a train-master. The only way that he can secure promotion is to hustle for himself. He has no right to expect the company to set up a training school and coddle him along into a more intelligent state of mind than he would naturally possess. And every conductor and engineer may have the satisfaction of knowing that such efforts would inure to his lasting benefit and be well worthy of the time and thought expended, even if he should never get the coveted promotion. Virtue is its own reward, and there is no good reason why an intelligent and educated conductor or engineman may not be as happy and contented as one who is narrow-minded.

But when it comes to the specific question of getting promoted; or of speaking with assurance to the trainman who aspires to promotion, what is the real situation? How much real comfort are you giving us? Is it not true that, on even terms, the conductor or the locomotive engineer can only rarely compete successfully with agents and opera-

tors and dispatchers in the race to qualify for high positions? And is it not unavoidable, in the nature of the case, that this should be so? These stationary employees, if I may so call them, have a much better chance to learn by observation the thousand and one uncatalogued facts which are needed to make an all around railroad officer. A generation ago it was necessary to take conductors and enginemen for superintendents because, after all the competent agents and operators were taken, there still were places unfilled. The country was growing more rapidly than the ranks of its competent railroad men could be filled up. Now, the denser population of the eastern States and the easier communication with the old world have changed these conditions.

The fact is that the conductor and the engineman who fail of securing the promotions that they desire are kept back, the same as are other classes, by the growth of the country and the increased severity of competition. Whether we do or do not blame them for the fatuous course that they take in going to the labor union for a remedy, we must admit that the situation is one which must urgently impel these men to seek some remedy. They are rapidly "getting left" and naturally cast about to find in what direction lies the most hope. When one has a desperate problem to deal with, it is the part of wisdom to squarely recognize its desperation. The conductor or engineman who wants a better place must not only do his work well but must hustle around and diversify his knowledge. The engineman who aspires to become an officer may perhaps have to go back a few years—if I may be allowed a Hibernicism—and leave his firemanship temporarily and take a job at a station. Very likely he will have to begin at the bottom again, and perhaps begin pretty near the bottom a third time when he returns to the locomotive department. If a conductor aspires to be a train master he must find some way to qualify himself to boss 50 or 500 men with as much skill as he manages five men. If, Mr. Editor, you are inclined, accuse me here of talking through my "hat," look at the records of the men whom you know who have "risen from the ranks" to important railroad positions. They have acquired experience in more than one department and they have done it at their own initiative and on their own time, and perhaps at considerable temporary money loss. Such a course is quite contrary to that of the loyal labor unionist, who continues in one rut and makes no advance except as hundreds of his brothers can be advanced with him; but is there any other or better way of accomplishing the object desired? And then, of course, conductors, station agents and all must submit to the inevitable technical graduate. The railroads get him, whether they like him or not, because they must have him.

But why do you give the unions the credit for causing all the changes that have taken place during the last ten or twenty years? The unions would not have broken down the discipline of the train service if superintendents had not weakly surrendered to them. A superintendent who swallows the cast-iron rules of the brotherhoods without putting up a strong fight against them is disloyal to his employer. It is his duty as a superintendent to give preference to his best men in spite of the seniority rule. Indeed, I think you will find that most seniority rules allow him to do this. They say that the senior man shall take the lead, other things being equal. It is up to the superintendents to show that other things are not equal. The brotherhoods and the partisans of bald seniority win too many contests by mere silence—silence made possible by the timidity

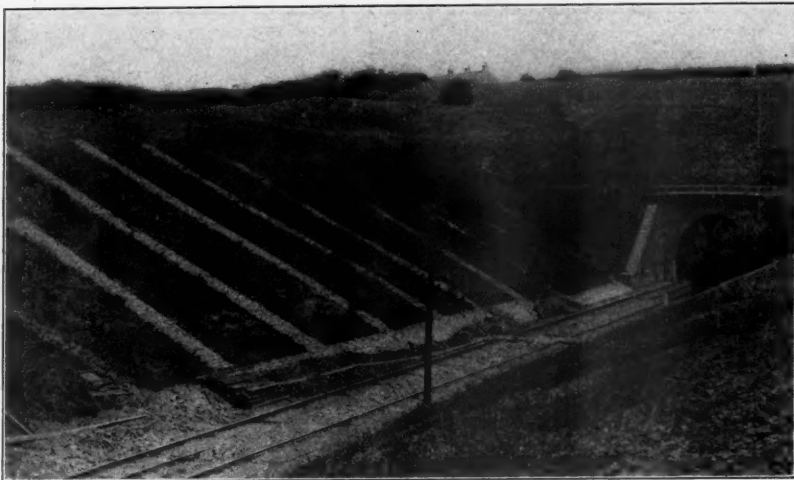


Fig. 1—Drained and Steadied Cutting at Gillingham Tunnel, London & Southwestern.

of the superintendent who does not dare to take a stand for the promotion of his best men. What brotherhood would dare to persistently oppose a strong and bold superintendent who should pick out his smart young men for promotion and in each case frankly give his reasons for the stand which he takes. The brotherhoods usually assert that the seniority rule is fair and just, and then wait for the railroad company to challenge their assertion; and the company, for some reason, does not challenge. If the men on the trains are ever to become sufficiently alert, versatile and broad minded to compete with station men who have a different experience, one in some respects better; or with the man from the schools, whose books have so improved his capabilities that his lack of experience can be endured, they must not only work with energy, and survey the field with keen intelligence; they must also be encouraged by officers who will help them to fight the vicious teachings of the brotherhood.

G. S. M.

The views of G. S. M. are nearly in line with those of the editor, when he divides the causes that keep men in a rut between company officers and brotherhood officers. The difficulties which beset the engineman or conductor who would place himself on the road to promotion are all too well known. The brotherhoods have power and use it, not to further individual development, but to drive bargains, in the most short sighted manner. The employer is not blameless, as

the *Railroad Gazette* has often pointed out. But the superintendent who is not equal to defying the brotherhoods and encouraging his best men, will usually be found to be

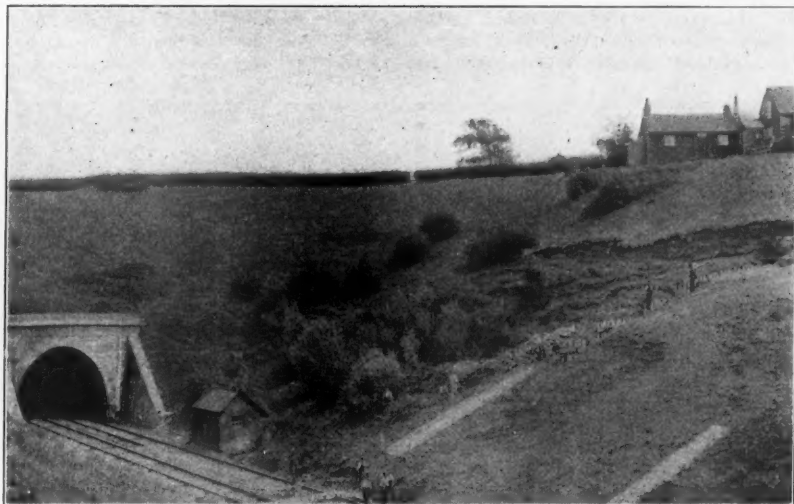


Fig. 2—A Slip at End of Gillingham Tunnel, London & Southwestern.

doing his best. He has one, two or three superior officers who hold him rigidly to beaten paths. He is, perhaps, overworked, if he is an ordinary man, or is soon needed

and taken for a higher office if he is above the ordinary. To get employees to break away from brotherhood prejudices he must be able to grant them indulgences, or premiums, or at least to make a visible exhibit of the Golden Rule, and to give assurance that his policy is to be permanent; and this is sometimes beyond his power. But these deficiencies of the management, whether chargeable to the president or the train-master, do not lessen the culpability of the brotherhood bully.—EDITOR.

Draining and Steadying Slips.

It seems likely, from general observations, that slipping banks occur proportionately more frequently in railroad work in Great Britain than they do in the United States. Slips are apt to be caused by layers of gravel or like permeable material, overlying clay, or like impermeable material. The British engineer has learned to treat these cases heroically; to put in drains and counterforts substantially, held at the toe of the bank, at considerable cost, but in such fashion as to "be no more by them troubled." He recognizes that a blocked railroad is quite a use-



Fig. 3—Bracing and Steadying a Fill, London & Southwestern.

less tool and intends that a slipping bank or a moving embankment shall be permanently stayed as soon as possible after the possible obstruction is discovered. He does not patch; he builds for eternity.

Mr. Jacomb-Hood, chief engineer of the London & Southwestern, has many of these problems to deal with on the lines from London to the Devon and Cornwall coasts. Each case forms a problem by itself, but the general plan is well shown in the photographs. The west end of Gillingham tunnel runs through and under the sources of a considerable spring brook. The first result of the cutting was that the spring water found its way to the ditches on either side of the track, and the wells at neighboring houses "went dry." This caused some legal complications. Later the banks began to slip, and the cutting was widened and the slopes reduced until the limits of the right-of-way were reached. This, however, was not enough, as is clearly shown in Fig. 2, where a sheer break in the upper layer let the gravel slip to the roadway and made lively work in keeping the line open. Fig. 2 shows the process of draining and steadying begun on the south side, and Fig. 1 shows the completed work on the north side.

A dry stone sloping wall is deeply toed

into the foot of the bank, so as to do the double duty of holding the counterforts and of forming one side of the surface-water drainage ditch. Under this wall is a drain for the spring water which is led to it down the bank through the broken stone under the counterforts, which consist of paving blocks. The width and depth of the trenches vary with the necessities. They should be dug deep enough to reach the underlying impermeable material; they should be wide enough to take care of all the water.

The after results of this piece of work were interesting. The neighbors who had dry wells, and the community who used the water from the stream below, agreed to accept for their uses all the water which came down the south side of the tunnel approach; leaving for railroad use the water draining down the north side. This has become highly important to the company, for in this chalk and limestone region the locomotive boiler tubes are soon coated. The company's reservoir of pure water got from the mouth of this tunnel is a money-saver for the locomotive department.

Fig. 3 illustrates similar work to that described above that has had to be undertaken in order to hold landslides that have started from time to time in the fills upon which the railroad is carried.

At a point about 120 miles from London on the Devonshire line there is a long fill or embankment carrying about four miles

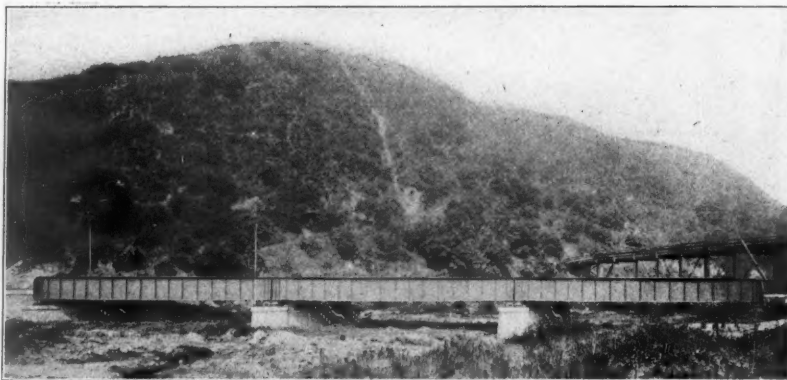
traffic is heavy and constant throughout the twenty-four hours. A constantly disturbed roadbed leads to so much inconvenience and delay to traffic that any means in reason would seem to be justified in securing a remedy.

New Southern Pacific Bridges Over the Los Angeles River.

The new steel bridges of the Southern Pacific over the Los Angeles river, known as the First and Second crossings, are good

examples of the heavy bridge work which this company is now carrying on throughout its entire system. The First crossing of the Los Angeles river is on the main line of the Southern Pacific just west of the city of Los Angeles, Cal., and the bridge, which has recently been built there, consists of three 96-ft., double-track, through plate girder steel skew spans, supported on concrete piers and abutments. These concrete piers, as shown in the photographs, are widened out under the bridge seat and narrowed between so that the area of the concrete and of the foundations is proportioned somewhat to the load supported. The steel work for this structure was made by the Phoenix Bridge Co., of Phoenixville, Pa., and the total weight of the bridge is about 1,300,000 lbs. The Second crossing of the Los Angeles river is also on the main line of the Southern Pacific east of the company's Arcade station at Los Angeles, and between East and West Los Angeles. The bridge over this crossing is composed of three 113-ft., double-track, through truss, skew spans supported on concrete piers, and the total weight is about 1,100,000 lbs. The steel work was furnished by the American Bridge Co. The notable feature of the construction was the extreme accuracy with which the shop work was performed by the bridge company. There were some 34,000 field rivets put in during the erection and it was not necessary to ream a single rivet hole. This bridge was designed and erected by the Southern Pacific in 1903. It is interesting to note that the plate girder bridge, with a total length of 58 ft. less than the truss bridge, weighs 200,000 lbs. more than the truss bridge, the assumed loading for both being the same.

We are indebted to John D. Isaacs, Engineer of Bridges, for the photographs shown.



First Crossing of the Los Angeles River, Southern Pacific.



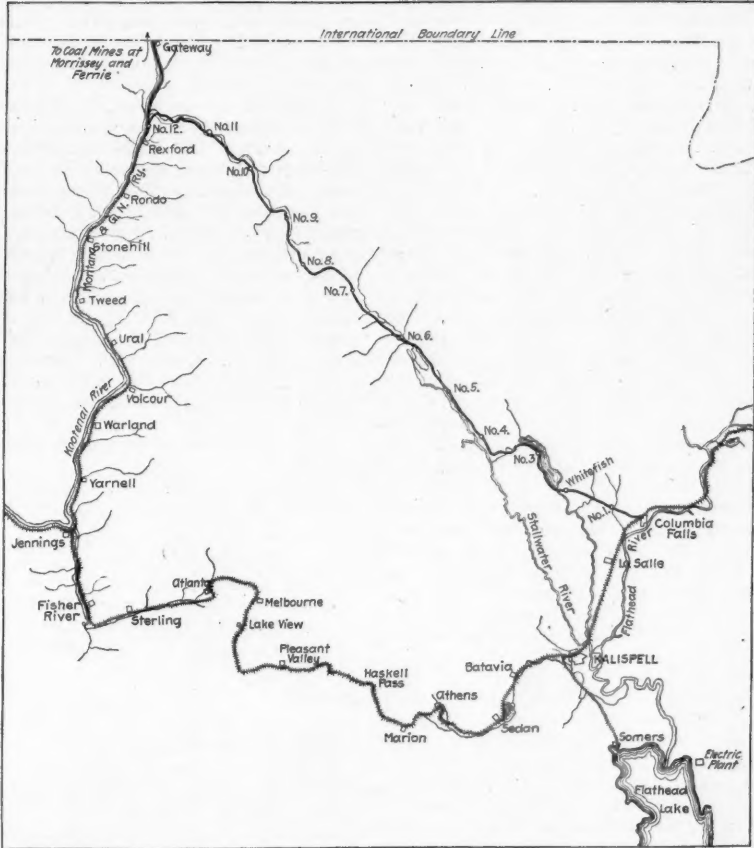
First Crossing of the Los Angeles River, Southern Pacific.

of railroad that has given trouble by subsidence or slipping ever since the line was opened in 1860. The last winter rains were abnormal in quantity, and probably by reason of defective cross drainage under the embankment, the mass of embankment at many points became saturated with water to the extent that the slipping and subsiding became serious. To avoid purchasing more land for the railroad and to provide perfect drainage for all time, the slipping embankments have been held by a deep and wide stone revetment wall, as shown in the picture, that forms the main water carrier to the lowest point. From this work as above, subsidiary drains, fitted with loose stone rubble, have been laid into the embankment at right angles to the line of railroad that have successfully overcome the trouble.

It should be explained that these expensive works are upon one of the main lines of a great English trunk railroad system between important centers, upon which the



Second Crossing of the Los Angeles River, Southern Pacific.

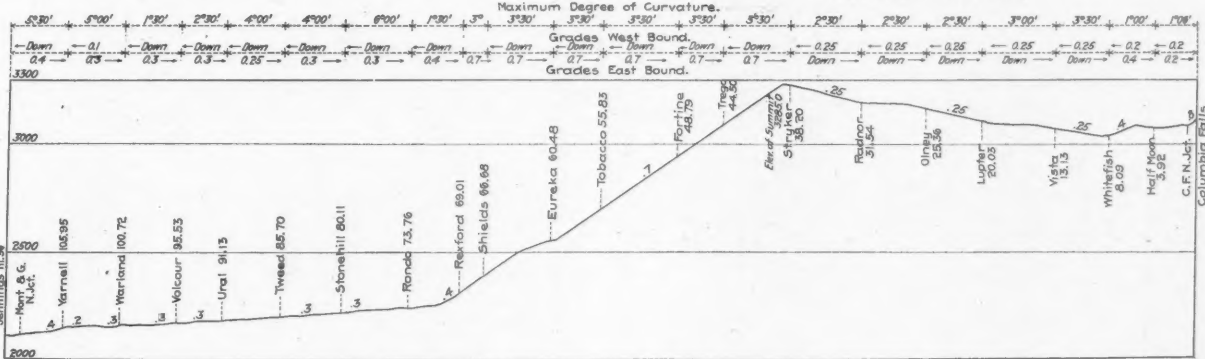


Map of Old and New Lines of Great Northern in Flathead County, Montana.

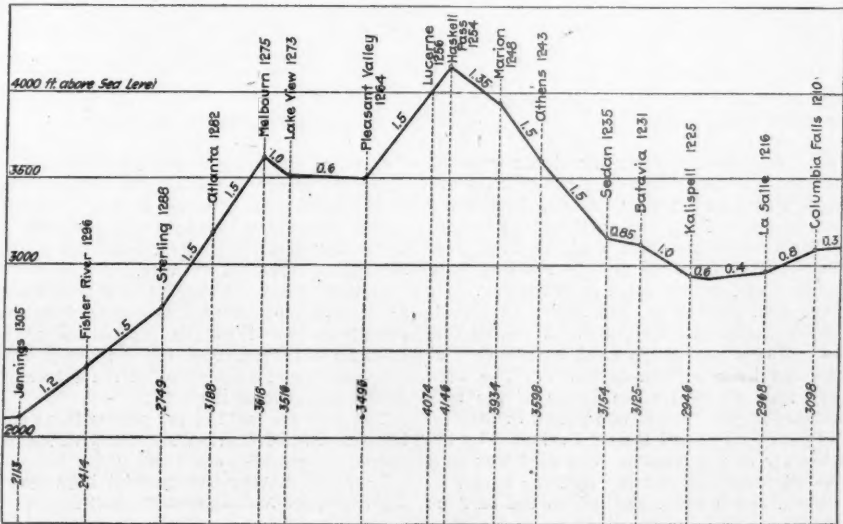
The Columbia Falls North Line of the Great Northern.

With the completion of its Columbia Falls North Line, which will be ready for operation sometime in September, the Great Northern will convert nearly 100 miles of its present main line on the Kalispell division into a branch. Although the new line will have a much lower maximum grade and total curvature than the present route, it will be about 17 miles longer. The accompanying map shows the two routes in detail. The new line starts at Columbia Falls, elevation 3,098 ft., about 60 miles west of the Main Divide of the Rocky Mountains. It runs in a general northwesterly direction, and encounters an almost unbroken series of water courses which made possible the relatively light grades obtained. It terminates at Rexford on the Montana & Great Northern, which runs north from Jennings, on the main line, to the coal mines at Morrissey and Fernie in British Columbia. This latter line follows the Kootenai River all the way to British Columbia, giving practically a water grade. The maximum grade in either direction on the present line is 1.5 per cent, while on the new line it is .7 east-bound and .25 west-bound. The highest point on the new road is, nearly a thousand feet lower than the present route. The following statement gives a comparison of the important characteristics of the two lines:

	Present Line.	New Line.
Maximum degree of curvature	10 deg.	3 deg. 30 min.
Total curvature	9,646 deg.	4,216 deg.
Maximum grade, west-bound	1.5 per cent.	.25 per cent.
Maximum grade, east-bound	1.5 per cent.	.7 per cent.
Total rise and fall	3,790 ft.	1,490 ft.
Length of line	95.2 m.	111.9 m.
Elevation of summit,		



Condensed Profile of New Columbia Falls Line, Great Northern.



Profile of Present Line between Kalispell and Columbia Falls—Great Northern.

Haskell Pass tunnel (Datum: Sea level) ..	4,148 ft.	3,285 ft.
Dickey Lake (summit)		

The 70 miles of new line between Columbia Falls and Rexford involved some heavy work, necessitating the removal of approximately 5,000,000 cu. yds. of material. No large track structures were required, and the 22 bridges on the line are all very small. There are also two short tunnels. The line is laid throughout with 77½-lb. rails.

The territory traversed by the new line contains no towns. A division point named Whitefish is being established eight miles from Columbia Falls. The railroad company owns the land and has laid out a town. The terminal facilities will include a yard with capacity for 625 cars, a combination passenger and freight station, a 20-pocket coal chute, 15-stall roundhouse with 70-ft. turntable and cinder pit and oil house, water supply and a combination two-story warehouse and office building. This building and the roundhouse and oil house are built of concrete blocks. In addition to the Whitefish yards there are 11 sidings on the line, all but one of which have a yard capacity

of 108 cars and a passing track capacity of 90 cars. The exception is No. 3 from Columbia Falls, the figures for which are 113 and 96 respectively.

There are 14 towns on the present line, the largest of which is Kalispell, the division headquarters. The section of this line between Columbia Falls and Kalispell will form part of a branch extending southward to Somers at the head of Flathead Lake, where large sawmills and a timber preserving plant* are located. It is expected that this line will eventually be extended along the east side of Flathead Lake to connect with the Northern Pacific at Jocko. The remainder of the line, from Kalispell to Jennings, will probably remain in service for some time—at least until the timber tributary to it has been removed. Main line traffic will, however, be turned onto the new route as soon as it is ready.

The location and construction of the new line were in charge of Mr. Alex. M. Lupfer. The contractors for grading, track laying and ballasting were Slens & Shields, St. Paul. We are indebted to Mr. A. H. Hogeland, Chief Engineer of the Great Northern, for data.

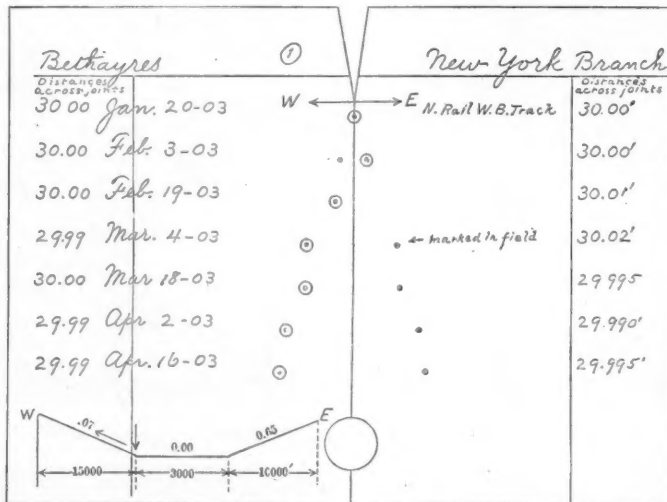
Notes on the Creeping of Rails.†

In January, 1903, the writer commenced a series of observations, for the Philadelphia & Reading, upon the creeping of rails at a number of points on the company's lines. This work was undertaken in order that certain questions propounded by Dr. P. H. Dudley, Reporter for America, on "Ways and Works, Rails for Lines With Fast Trains," for the Fifth International Railway Congress, could be answered as intelligently as possible. The writer is enabled to pre-

sent these data to the society by the courtesy of Theodore Voorhees and William Hunter, Members, Am. Soc. C. E., with the hope that they will prove of interest and will elicit discussions on a very interesting subject to the railroad engineer.

Among the questions, in the circular letter of Dr. Dudley above referred to, were ten under the heading "Methods for preventing creeping, especially on double-track lines and on steep gradients," and the investigations were made because there were no records of rail movements from which even ordinary answers could be obtained. That there is a longitudinal movement of the rails, under certain conditions, is a firmly established fact, but how it was influenced by conditions of roadbed, weight of rail, grades, traffic, etc., remained to be determined. The results of the observations, as will be shown later, are too few to establish firmly any laws, but it is hoped that what has been done and is here presented will make one link in a chain which ultimately may allow certain definite principles to be laid down. The observations were not undertaken to ascertain the best method of preventing the creeping of rails, and therefore no discussion of this interesting feature is presented.

In order to make the measurements as carefully as possible, two stakes, 3 by 1½ in., and 24 in. long, were driven level with the ground about 15 or 20 ft. from the nearest rail, where possible, and located at right angles to the track, if on a tangent, or on a radial line, if on a curve. They were placed so as to be approximately in the center of two rails and miss any joints. In the top of each stake an ordinary surveyor's tack, with a depressed center, was driven. A transit was set up over one stake and sighted on the other, and points on the line were marked on the flange of each rail with a fine center-punch. All observations were made on double-track lines, and, on the tops of the two outside rails, similar marks were made.



Field Card for Measuring Rail Movements.

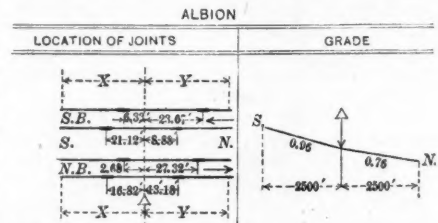
rail. The division superintendents were requested to notify the repairmen to avoid these joints as much as possible during the continuance of the observations. It is safe to say that no disturbance of the track took place during the time the observations were being made, unless noted in the tables.

A card, similar to that shown in Fig. 1, was prepared for each rail. A center line was drawn across the card terminating at the top in a regular-shaped V. The card was then placed on the flange of the rail, a sharp-pointed pencil was placed in the center-punch mark and the card oriented by the observer at the transit. The card was then placed firmly against the rail, the pencil removed, and a point marked on the card on the line given by the observer at the transit which had been previously set on one

stake and sighted on the other. Upon returning to the office this point was transferred to the opposite side of the center line, as in its first position it indicated a reverse movement of the rail.

On the cards prepared for the outside rails, the distances across the joints were recorded, marked "X" when measured to the left, and "Y" when measured to the right. Temperature observations were also made and recorded, the thermometer having been exposed to the direct rays of the sun while the observations were being made. The length of time consumed in making the observations approximated about 15 min., depending upon the difficulty in finding the punch marks obscured by grease, dust, dirt, snow, ice, etc., on the rail. The work required the services of two men, one with the transit and the other handling the cards on the rails.

This method was decided upon after some



S.B. TRACK		X	Y
Jan. 14	30°	30.00	30.00
Feb. 11	40°	"	"
Mar. 11	56°	"	"
Apr. 7	62°	"	"
May 7	90°	"	"
Nov. 24	44°	"	29.98

W. Rail		X	Y
Jan. 14	30°	30.00	30.00
Feb. 11	40°	"	"
Mar. 11	56°	"	"
Apr. 7	62°	"	"
May 7	90°	"	"
Nov. 24	44°	"	"

E. Rail		X	Y
Jan. 14	30°	30.00	30.00
Feb. 11	40°	"	"
Mar. 11	56°	"	"
Apr. 7	62°	"	"
May 7	90°	"	"
Nov. 24	44°	"	"

W. Rail		X	Y
Jan. 14	30°	30.00	30.00
Feb. 11	40°	"	"
Mar. 11	56°	29.99	30.01
Apr. 7	62°	"	"
May 7	90°	29.985	30.00
Nov. 24	44°	29.98	"

E. Rail		X	Y
Jan. 14	30°	30.00	30.00
Feb. 11	40°	"	"
Mar. 11	56°	29.99	30.01
Apr. 7	62°	"	"
May 7	90°	29.985	30.00
Nov. 24	44°	29.98	"

Complete Record at Albion.

discussion, and adopted because it seemed to eliminate errors in making the notes, and at the same time showed on the cards the actual movements, without the necessity of measuring small distances, with the probabilities of errors in reading.

In most cases the observations were made at intervals of about two weeks with the exceptions noted in the records. On the Atlantic City Railroad, the intervals were a month apart, on account of the extremely slow movement of the rails.

The plan for making the observations contemplated the following outline, with special reference to grades and traffic:†

1.—Lines having the greatest high speed, light tonnage and lightest grades;

†Space limitations have made it possible to show only a few of these tests herewith.

*Railroad Gazette, May 30, 1902.

†Extract from a paper by S. T. Wagner, presented before the Am. Soc. C. E., Sept. 7, 1904, and printed in the Proceedings, page 462.

2.—Lines having high speed, heavy tonnage and light grades;

3.—Lines having average speed, average tonnage and moderate grades;

4.—Lines having slow speed, heavy traffic and heavy grades.

In most cases inquiry was made before the points were selected, to ascertain where creeping had been noticed, with a general purpose of selecting the points so that they would fulfill most of the requirements.

The following are detailed, and concise descriptions of the features of interest on the branch roads on which the points were selected.

Atlantic City Railroad.—This road is a double-track line, extending from Kaiguns Point, Camden, N. J., to Atlantic City, N. J., and carries moderate traffic, compared with the other lines considered, but most of the passenger traffic is carried at high express

54.9 miles. A very heavy traffic is carried, the passenger business being carried at high speeds. There are eight passenger trains daily in each direction, making the trip from Wayne Junction to Bound Brook in 58 min., while five other trains each way daily make the same run in 66 min. The line is equipped throughout with 90-lb. rails and stone ballast. The maximum grade is 0.7 per cent.

At Bethayres the point is located at the foot of a 0.7 per cent. grade which is about 15,000 ft. long from the west. There is a level stretch of about 3,000 ft. and then a grade of 0.65 per cent., about 10,000 ft. long, to the east. The point is on an embankment over low swampy ground.

Bethlehem Branch.—This branch leaves the New York Branch at Jenkintown and extends to Bethlehem, Pa., a distance of 46.0 miles. It is double-tracked throughout. The grades are heavier than on the New York

best known data on the subject, so that the results here obtained may be better understood.

There are two longitudinal movements in rails:

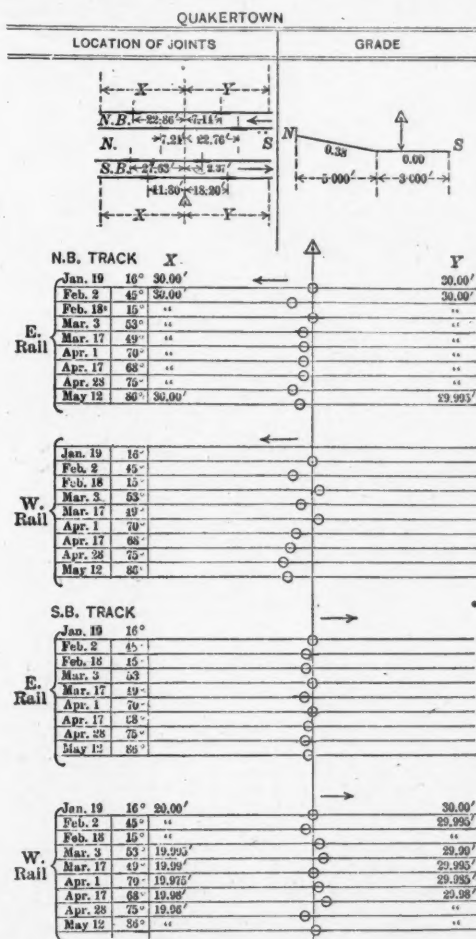
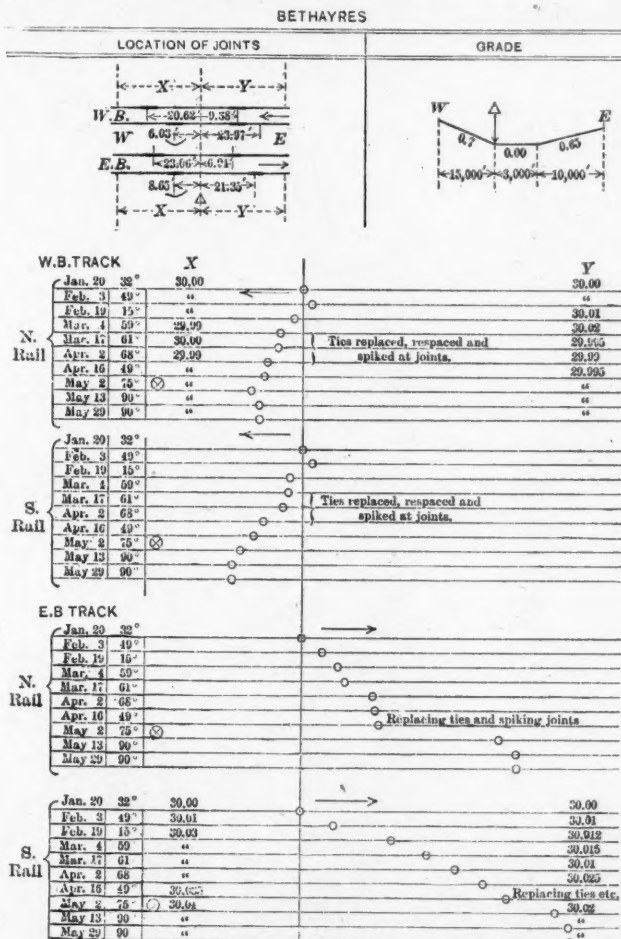
1.—A molecular movement of expansion and contraction, and

2.—A progressive shifting of the rails bodily, known as creeping.

It is now generally conceded that the principal cause of creeping is the wave motion in the rails set up by moving trains.

If each rail, under this wave motion, is not made to hold fast to the ties and the ground, it will remain shoved ahead, by a very small amount, by each passage of a train.

If it were possible to tighten the splices so as to hold against creeping, they would be too tight to allow the rails to expand easily, and much evil would result.



Diagrams from Field Cards, Reduced One-half.

speeds, the schedule of the so-called 60-min. trains being 50 min. from Camden to Atlantic City, a distance of 55.5 miles. The freight business is not heavy. The alignment throughout is very good, and the grades, with one exception, between Clementon and Albion, very light.

At Albion, both tracks are laid with 90-lb. rails of the section recommended by the American Society of Civil Engineers, and have stone ballast. The point was selected as being at the bottom of the heaviest single grade.

On account of the high-speed traffic, the physical condition of the road is very good.

New York Branch.—This branch is a double and in some cases a three-track line extending from Wayne Junction, Philadelphia, to Bound Brook, N. J., a distance of

line, the maximum being 1.13 per cent. The traffic is not as heavy nor the speed as fast as on either of the lines already mentioned. As a general thing, also, the weight of the rail is 80 lbs. Rail creeping was reported to have been noticed near a number of the points selected.

Quakertown is on a level stretch of track slightly beyond the foot of a 0.38 per cent. grade. The south-bound rail is 90-lbs. and the north-bound 80-lbs. The ballast is of furnace slag.

Probably the best general discussion of the subject of creeping rails is that given by W. M. Camp, M. Am. Soc. C. E., in his "Notes on Track," and the writer has taken the liberty of extracting from it a few notes on the general principles. These are given with the object of presenting concisely the

Three important facts should be noted:

1.—The creeping is most rapid during hot weather;

2.—It is greater on double than on single track; and

3.—It moves with the trains.

Rails usually creep most on embankments, especially on those newly made, and little or least on solid, hard ground, not raised above the surrounding level. Track laid on swampy or boggy land creeps worst of all.

The manner in which rails will creep, and the amount, depends on:

1.—The character of the ground or foundation for the track;

2.—The direction in which the train loads are heavier;

3.—The proportion of the weight distributed on the two rails;

4.—The speed of the trains; and
5.—The manner in which the ties are spiked.

A very brief summary of what seems to be shown by the observations is as follows:

1.—At 32 different points to determine which rail moved the most, the right or the left, the following was found:

Location.	Alignment.	Bearing.	Rails.	Ballast.	Joints.	Cut or fill.	Traffic.	Remarks.
ALBION: Between station and 14 M.P. At tel. pile 458.	Tangent.	N. 37° 45' W.	S. B. 90-lb. N. B. 90-lb.	Stone. Stone.	All joints spiked on ties.	Embankment, 12 ft. high.	N. B. 27 Passenger, 4 Freight, S. B. 28 Passenger, 5 Freight, Daily.	Subgrade—gravel and sand. Alignment and surface good.
BETHAYRES: West end, bridge over Paul Brook.	Tangent.	N. 79° 30' E.	E. B. 90-lb. W. B. 90-lb.	Stone. Stone.	Spikes not in joints of E. B. track; W. B. track spiked at joints.	Embankment, 15 ft. high.	E. B. 41 Passenger, 19 Freight, W. B. 49 Passenger, 20 Freight, Daily.	W. B. track, ties respaced and spiked between March 17 and April 2 at Bethayres. E. B. track do. do. April 16. Subgrade—earth fill on marsh. Alignment and surface good. Decided evidence of creeping on E. B. track. Will be spiked as soon as ties can be replaced. Newtown crossing moved 1½ in., all rails spiked and ballast in.
QUAKERTOWN: 30 ft. north of Hall signal, 825 ft. north of yard switches.	Tangent.	S. 25° E.	S. B. 90-lb. N. B. 80-lb.	Slag. Slag.	West rail of S. B. track not spiked on account of creeping. All other joints spiked to ties. Standard joints.	No cut or fill.	N. B. 12 Passenger, 11 Freight, S. B. 12 Passenger, 11 Freight, Daily.	Alignment and surface fair. Shortage of ballast between ties. Subgrade—earth. Foreman reports west rail of S. B. track creeps to south. Last summer it moved 12 in. ties at joints showing creeping.

At 21 points there was no practical difference.

At eight points the right rail moved most.

At three points the left rail moved most.

The right crank leads on all engines.

2.—In seven cases out of 12 the greatest creeping is shown on descending gradients; on the remaining five there is practically no difference.

3.—Decidedly more creeping is shown where the roadbed is carried on embankment over swampy ground, than in other places.

4.—More creeping is generally shown on imperfectly maintained track, than where it is kept in first class condition.

5.—As far as the observations went, it was shown that there was less movement than was expected from the reports of the repairmen, although, in some cases, the points were not at the exact locations of the worst reported creeping.

One of the most interesting points of the series is that at Bethayres, on the New York Branch. At the time the points were located new rails had just been laid, in cold weather, and it had been impossible to space the ties so as to spike all the joints to them. The result was a considerable amount of motion. Between March 17th and April 2d, the west-bound track was fixed, the ties respaced and all the spikes driven in the joints. In spite of this, the movement continued, and was probably due to the disturbance of the roadbed. The Philadelphia, Newtown and New York Railroad crosses this branch a short distance east of this point with a grade crossing, and when the eastbound track was fixed up, about May 2d, the rails were disturbed between the point of observation and the crossing, but the motion continued afterward. The excessive motion is probably due to the fact that at this point the track is not as rigid, longitudinally, as at other points, on account of the crossing frogs at the Newtown crossing and, also, chiefly on account of the swampy ground under the embankment.

The next most serious movement seems to be at Pleasantville, on the Atlantic City Railroad, over the salt marsh, where the movement has been continuous and regular on a nearly level line. These two points seem to bear out the principle that creeping is most to be feared when the character of the foundation permits an amplification of the wave motion. The speed of all trains at both of

these points is high. There are a number of facts shown in the tables and diagrams which are very hard to explain, but it is hoped that they may throw some light on points where other records are wanting. It is to be regretted that more observations were not made on curves, in order to ascertain the effect of the unequal distribution on

a hole up to 20 in. in diameter and 20 in. deep. The spindles have a vertical adjustment of 24 in., and the maximum distance between the spindles is 13 ft. 4 in. The spindles are counter-weighted and are driven by tangent gearing. They are supplied with power feed, hand feed and quick hand return. The heads are moved along the cross rail

the two rails caused by heavy, slow-moving freight trains passing around a curve having the proper superelevation for the higher speed of passenger trains.

Railroad Shop Tools.

(Continued.)

BORING MACHINES.

The locomotive rod boring machine, Fig. 1, is made by the Niles-Bement-Pond Company, New York. This type of tool is especially designed for rod boring, but is adapted to a variety of other work. In many cases one man can bore two separate pieces of work with this tool. This machine will bore

with a ratchet lever and rack and pinion. The heads are held in position by clamp bolts. The work table is 32 in. wide by 16 ft. long, and is supplied with bolt slots for holding work.

The illustration, Fig. 2, shows a double drilling or boring machine designed for drilling connecting rods, bridge chords, etc. The machine consists of two drill presses which are adjustable along a heavy work table. The presses are secured to the table by bolts. They have a spindle 3½ in. in diameter and a vertical adjustment of 12 in. The distance from the center of the spindle to the face of the column is 12 in. The spindles are counterbalanced and are fitted with power feed and quick hand movement. The presses are driven by independent motors,

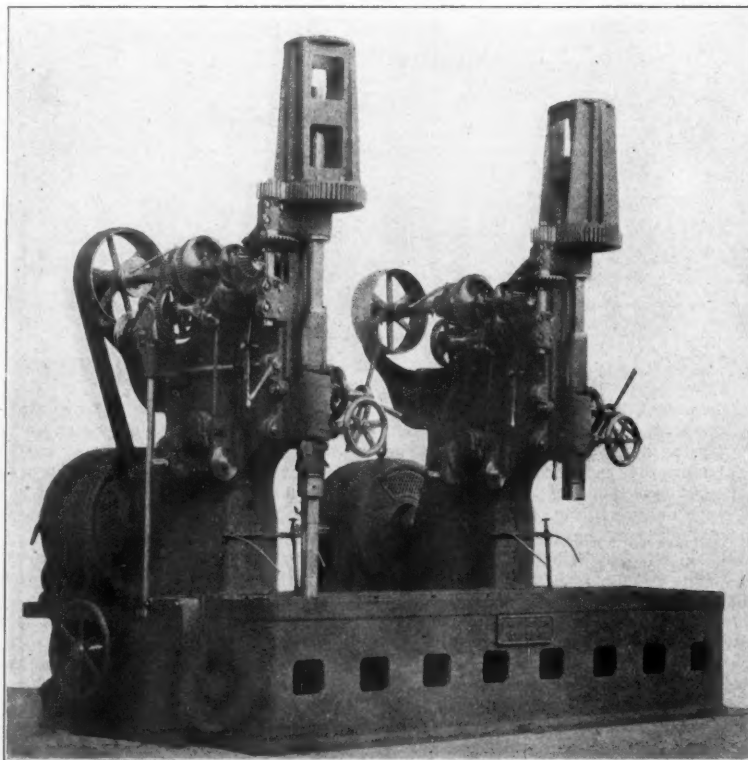


Fig. 4—The Baker Bros. Double Spindle Boring Machine.

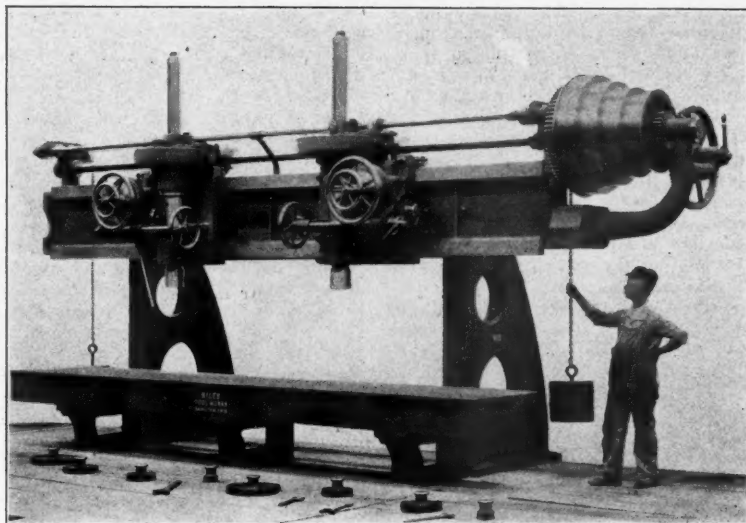


Fig. 1—The Niles-Bement-Pond Locomotive Rod Boring Machine.

or they may be driven by a countershaft. This machine is made by William Sellers & Co., Philadelphia, Pa.

The duplex locomotive rod boring machine, Fig. 3, is made by the Newton Machine Tool Works, Philadelphia, Pa. The machine is of recent design and is especially adapted for the use of modern tool steels. The spindles are 4 in. in diameter and are driven independently. They are counterweighted and have an automatic feed of 16 in. obtained by a positive gear which has four speed changes. The feed motion is taken directly from the spindle sleeve. The heads are adjustable on the rail, having a minimum distance between centers of 4 ft. and a maximum distance between centers of 11 ft. 9 in. The maximum distance between the work table and the end of the spindles is 26 in.

The illustration, Fig. 4, shows a double spindle boring machine designed for boring locomotive connecting rods, and other heavy facing and counterboring operations. This machine is a combination of two boring machines which are mounted on one base. The bedplate has a working table 11 ft. 2 in. x 2 ft. inside the oil grooves. The inside of the table is hollow and forms an oil tank from which lubricant is supplied to the cutting tool. Each spindle is provided with a separate pump.

The machine has a spindle feed of 24 in., and is belt driven. The driving pulley is 20

in. in diameter and $6\frac{1}{2}$ in. face. It is triple back geared, the greatest ratio of gearing being 51 to 1. In addition to the three changes obtained by the back gears, the motor, which is a Westinghouse type "S," 13 h.p., 110-220 v., has a speed variation of 4 to 1. The controllers, which are not shown in the photograph, are placed at the ends of the long table. These have 15 steps for the forward speed, and six steps for the reverse speed, making with the back gears, 45 speed changes forward and 18 speed changes reverse, giving a speed variation from 3 r.p.m. to 90 r.p.m.

Both spindles are adjustable along the base; one by hand and the other by power. The maximum distance from center to center of spindles is 9 ft. 6 in., and the minimum distance between centers is 3 ft. 4 in. The distance from the frame to the center of the spindles is $17\frac{1}{2}$ in. The maximum distance from the spindle to the table is $25\frac{1}{4}$ in., and the minimum distance is $11\frac{1}{4}$ in. The spindle feed is 14 in. and the distance from the floor to the top of the table is 28 in. The machine requires a floor space of 13 ft. x 11

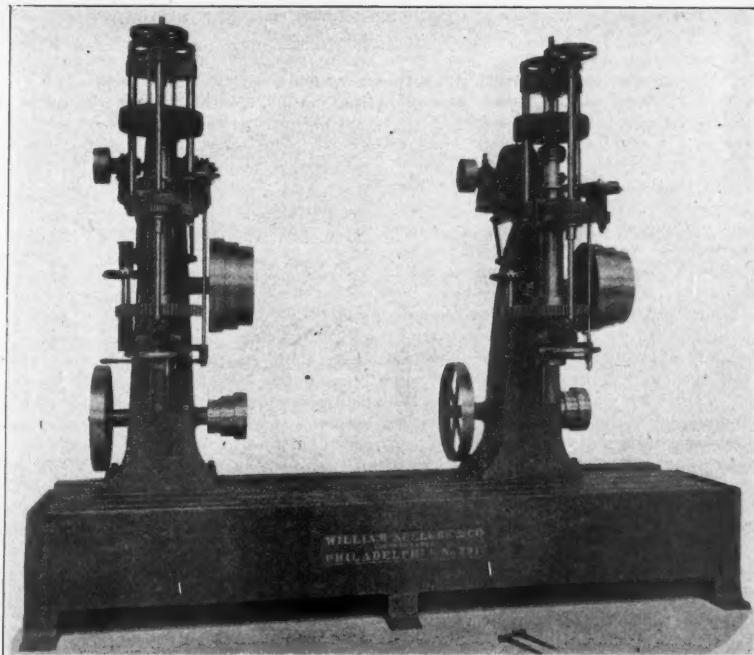


Fig. 2—The Sellers Locomotive Rod Boring Machine.

ft. 6 in., and the weight is 32,000 lbs. Baker Bros., Toledo, Ohio, are the makers.

(To be continued.)

How to Handle Freight Safely.*

(Concluded from page 298.)

In taking orders and receipts for freight, a stamped or printed signature is no good. There isn't a bank that will honor a check with a stamped signature. We wouldn't take a check with the signature stamped or printed on it, but every day you take these orders with stamped and printed signatures. We are in the same position as the bank. Now if a man gives an order or a receipt we are entitled to have his name on it or that of someone authorized in writing. Don't take any more of them. We don't want them. They aren't worth the paper they are written on.

Whenever any summons, notice or legal document of any kind is served you are to

*Extracts from an address by R. C. Richards, General Claim Agent of the Chicago & North-Western, recently delivered at meetings of the agents of the company.

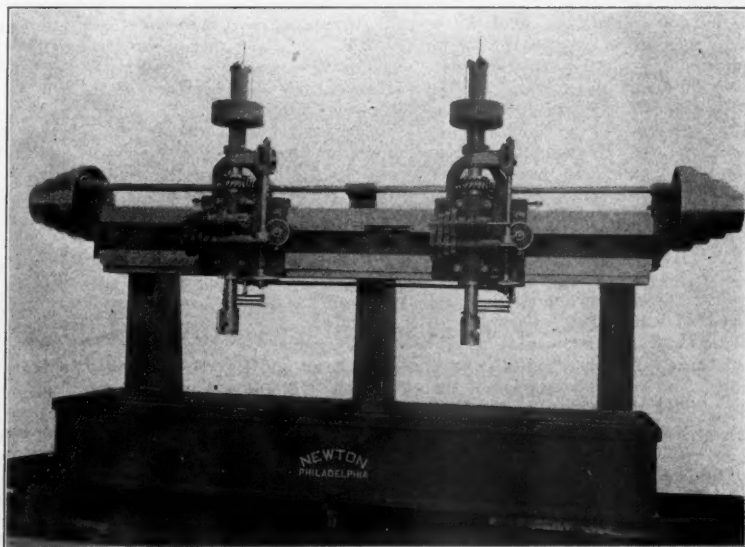


Fig. 3—The Newton Double Spindle Locomotive Rod Boring Machine.

notify the General Counsel and not the General Claim Agent, by wire and send these papers to him by first train. Now don't keep on sending them to me. There is never a day goes by but what I get a garnishee summons, replevin writ or something of that kind from some one.

While on this subject I want to call your attention to operating department rule No. 892, which prohibits any employee acting for the company procuring a warrant for the arrest of anyone without first consulting the law or claim department. This is to prevent arrests being made on insufficient evidence and thus avoid suits for false arrest or malicious prosecution.

We have an immense amount of trouble and loss with order and notify shipments. We have frequent claims on shipments billed to ORDER or NOTIFY that were delivered without the bill of lading. Just how much we lose every year on account of agents failing to comply with that rule I don't know, but we get a great many claims. They are invariably for large amounts. They run from \$100 up to \$2,000. The reason the shipper has that freight billed to order or notify is because he don't trust the man he sells the goods to. *The bill of lading must be endorsed.* When you get the shipment the consignee comes and says to you: Now, just think of the amount of business I do with you each year, look at this bank account. I am perfectly good for the amount of the shipment and I will pay the draft when it comes—you have all been through it, every one of you that has run a station has had this experience. Well, when we deliver that shipment without a bill of lading we know what happens. We are chasing the other fellow. About nine times out of ten we don't get the money, just as long as we have the goods in our possession they will be chasing us, but the minute we deliver the goods without the bill of lading we will be chasing them and the chances are we won't get our money. There is no reason why, if the shipper don't trust the consignee, we should. He knows more about him than we do. It don't make any difference if it is the biggest man financially in your town, don't deliver it to him. If he makes a kick about it refer him to me. Tell him you had a talk with the General Claim Agent, put the responsibility on me, but under no circumstances, no matter who the man is, do not deliver the shipment to him *without the bill of lading properly endorsed.*

We must not receive shipments to the order or notify consigned to places where we have no agent. When it gets there nobody is there to take up the bill of lading. The rule says not to do it. The conductor is not as familiar with these instructions as you ought to be, and he unloads the stuff there. He don't know what to order or notify means because he hasn't been told about it. If you do by mistake get it, always bill it to the station beyond. And if any conductor gets a shipment like that he must not deliver it, and it don't make any difference if the consignee is there but take it to the next station. Shipments of large value for prepaid stations should not be unloaded unless the consignee is there himself.

Perishable freight that is refused by the consignee must be sold; don't sell it to the consignee. If you sell it to the consignee and don't get the invoice price for it the shipper will say that it was a put up job. Sometimes trees and nursery stock which should be prepaid, come from connecting lines and there is not enough money to prepay through. Don't hold those goods, but send them along. Now then, why is this necessary? The stuff is sold by an agent and if it don't get there by the time the

agent does and the farmers come in to receive it—nine times out of ten they don't want the stuff. They only ordered it because the agent talked them into it and are just looking for a chance to refuse it—but if it don't come the day the agent agreed to have it there they won't take it. Then what happens? I will leave that for you to guess. Every time we get a claim because it was delayed. It is better to take chances on getting \$4 or \$5 charges than to have a claim of \$90, or \$100 just because we didn't send it along. If there are any charges lost on it I will back you up.

When you load a car take the old seals off and don't leave them there until they grow whiskers. Put on your station seals and when you load these cars fasten the end doors inside with a cleat. That is where our robberies occur. That is the reason we want them cleated before sending the car forward. And when you take a seal record take the lock and seals on all the cars. That don't mean only every third or fourth car, but every car that comes. Some roads seal all cars; lime, horses, lumber, ties, posts, and if such a car passes over our line and there is a loss from it and we haven't got the seal record then we have got to pay the claim. If, however, we have the seal record and a claim has to be paid it is divided between the two roads. We are getting claims all the time from our friends that seal all cars and we haven't got the seal record. The agent says: "I didn't take the seal record because there was lumber in the car." And the vents on refrigerator cars and the doors on ice boxes; we want a record of those doors and vents whether they are open or shut just the same as the seal record.

I recall a case that illustrates carelessness in checking at transfer points. The claim was for \$1,875, the value of a box of rugs and bric-a-brac, the wedding presents of an army officer shipped from San Francisco to Washington. It got to Wood street, was transferred there into a car for the Pennsylvania, and they checked it short and so receipted for it. When the box did not show up at destination, the owner and all his friends between San Francisco and Washington got after me. We searched every transfer house in Chicago, had the stations at Washington examined, but no box. Finally it occurred to us that as there were other household goods for Newark, N. J., in the car in which we claimed to have loaded this box, that it might have been forwarded with that shipment so we sent a man down there. That consignment had been sent to a warehouse, and there was our box with it. We sent it to Washington by express as should have been done originally and the owner actually wrote me a letter thanking me for my trouble. That letter I am going to get framed when my salary is raised 700 per cent. Now if the box had belonged to the man who checked it short he would have checked over everything that came out of the same car to find it. Had he done so it would have been found. If the man who loaded the Newark shipment, the man who unloaded it at Newark, or the man who delivered it to the warehouse had checked it carefully, the Washington box would have been found. Surely there must be gross carelessness and lack of system or supervision, or mistakes of this kind would not be made by four different men handling the same consignment. The Pennsylvania is not the only line on which such mistakes occur.

When it comes to the matter of handling horses in carload lots, it makes me tired. We had claims for \$11,900 in the last twelve months on horses. Just because we didn't handle them right. If a shipment of horses is going to some place and we have poor

connections, notify the Train Despatcher to get the car into some train that will get it to destination. And when you do the switching, don't use a car of horses for a bumping post. Don't make a flying switch with a car of horses. Don't use it next to the engine because it has a good air-brake, but handle horses the same as you would babies. Handle them the same as if they belonged to you. This matter of claims on horses is getting to be a nightmare with me.

Bear in mind the important part of a claim is not the man's name or way-bill reference, or car number. It is the amount of it. That is what makes up this \$330,000 a year. If you are unable to furnish the information asked for on form No. 135, explain why. In the presentation of claims on all local shipments, if you will give me the information called for on that blank and furnish the necessary papers, the chances are that we can tell you the next day whether it will be declined or paid. I think last month we had about 5,300 freight claims and over one-half of them were claims on local shipments. Now, out of the 2,500 local claims there were some 1,400 that came in the shape so they should be paid or declined that day. If you will present your claims as you should we will pay them promptly or we will decline them promptly. We cannot do that on freight that is lost or damaged on other roads, because we don't know whether they will pay. It is a good thing to have a reputation of paying claims promptly. The women all say they trade with Marshall Field because he adjusts their complaints promptly. And we want the same reputation in dealing with our customers. If you have claims that don't receive prompt attention, write me personally, and I will find out what the trouble is. We will either have the claim paid or give some reason why. We want to prevent the claimant from going to the other road. We want to keep all of the business. That is what we have got our sign out for. If there is anyone connected with my department that does not attend to business; that is discourteous and don't answer your communications, write me a personal letter and I will apply the remedy.

Frequently a shipper presents a claim on account of delay in shipments getting to destination. . . . We don't want to make agreements for time in transporting property. If we do make an agreement and there is a claim, for God's sake tell me, give me the information and don't have any fairy tales. Just give the facts. If we are to blame in the matter we want to know it. The same way when you get a claim that is perhaps a little doubtful; we don't want to antagonize a man for a couple of dollars. . . . If a man comes to you with an unmeritorious claim talk him out of it, but if you can't talk him out of it send it to me immediately.

Now I have shown you how many of the losses occur; I shall tell you how I think many of them could be avoided. "*An ounce of prevention is worth a pound of cure.*"

Handle the company's business the same as your own.

In case of doubt always (not sometimes) take the safe course.

Speed must give way to safety. Expedition in the handling of traffic must give way to accuracy.

Read and reread the book of rules so that you will know what they are, the same as you did the first letter you got from your superior officer commending some good act you had done, or that first letter you received from your first sweetheart. . . . And when you are up against some proposition that you do not understand, and you cannot find the desired instructions or ad-

vice in the book of rules, ask your neighbor agent. If he does not know ask the Superintendent or other proper officer.

When a passenger or employee is injured have them properly cared for; call a surgeon to attend them. If we have a doctor at the place he should be called at once. If not, call the nearest one, and if the company's surgeon is too far away and attention is necessary before he can arrive, call a local doctor and the company will pay for it. Next comes the traveler on the highway. He should be cared for in the same way until you are notified to the contrary.

If any tramps are injured or killed in stealing rides on trains or walking on the track, turn them over to the town authorities. . . . But if the authorities won't take care of them don't let them lie in the street. Take care of them until we can make arrangements.

When an accident occurs report it on Form 148, and report all accidents, not just those you think the company is to blame for, report everything. Rule 914 says that an employee, whether on duty or not, who witnesses an accident, must report it. Please comply with the rule. If you do that then you have done all the company requires. Get the names of all the witnesses, especially of outsiders. When people get killed away from a station the trainmen sometimes are at a loss to know what to do with the body. They have an idea that they mustn't touch or move the body until the coroner or some other official is called to see it. That is not right. We should pick the body up as kindly and as carefully as we can and take it to the next station and notify the authorities. We don't want to leave it on the ground. Put the body on the train and bring it in. Think how you would feel if it was your brother, sister, father or mother that was killed. Transport the body to a station in the county where the accident occurred. Never take it out of the county if you can help it. If there is no station in that county,

penses; if you do he will simply give the same service he would have done without the order but when he makes up the bill there will be nothing spared in the way of expense.

Buffet Parlor Car for Interurban Service.

A buffet parlor car for electric interurban service is an innovation that has been introduced by the Aurora, Elgin & Chicago.



Exterior of Buffet Parlor Car—Aurora, Elgin & Chicago.

At first it will be used only in special service, being available for special parties who may wish to charter it. It will probably be in demand by golfers traveling between Chicago and Wheaton, 21 miles out, where the Chicago Golf Club is situated, and for theatre parties. It is the intention to put it in regular service later on, and should results justify it, other cars will be added.

In external appearance the car is similar to the standard cars of the company, except for the oval window seen in the exterior view. The kitchen, which is 6 ft. wide, is located at this point and separates the in-

A buffet luncheon is served, the cooking being done on an electric stove.

The interior appearance of the car is most attractive. It is finished in Flemish oak stained an apple green, with neat inlaid borders of maple and holly. The ceiling is canary yellow trimmed with gold. The electric lights have frosted globes. The carpet is green, harmonizing with the woodwork.

The idea originated with Mr. L. J. Wolf, President of the company. The car, which

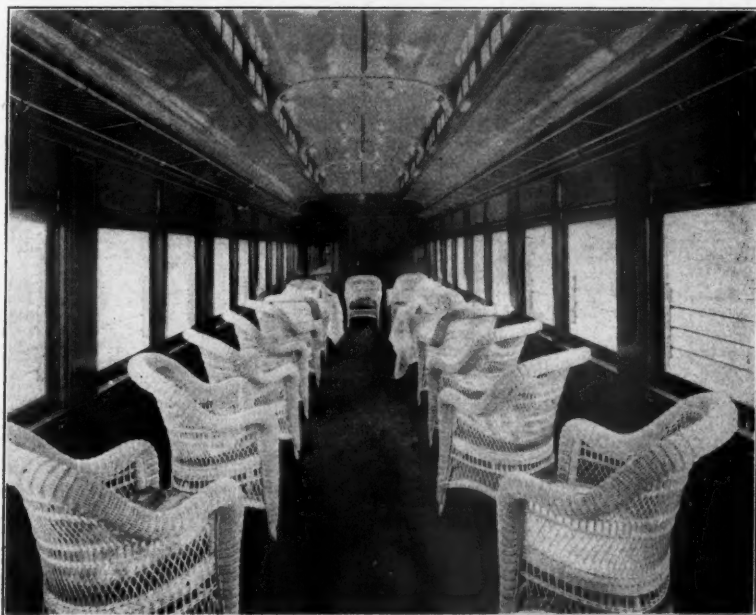
weighs 84,000 lbs., was built by the Niles Car & Manufacturing Company, Niles, Ohio, and cost about \$12,000.

Specifications for Structural Steel.

The following abstract of an editorial from *Engineering*, July 22, 1904, is of particular interest at this time in view of the efforts which are being made to adopt international standard specifications for structural and rail steel. Further comment will be found in the editorial columns:

Although British and Continental engineers have, since the use of mild steel commenced, chiefly employed only one grade of the material, such has not been the case in America, where, until quite recently, two grades—viz., soft steel and medium steel—were almost universally specified by engineers, the grade selected depending, of course, on the special duty which the steel had to perform. If we look through the specifications for structural steel drawn up by any of the leading American engineers, or bridge-builders, we find that the two grades—soft and medium—are always mentioned, and are used for distinct purposes, in a way which points to a strong faith in their different qualifications. Take, for instance, the American Bridge Company's general specifications for steel highway bridges. In this there are both soft and mild steel specified, and, in addition, a quality of steel of an extra ductile quality, to be used for rivets. For soft steel the ultimate strength ranges from 52,000 lbs. to 62,000 lbs. per square inch, with an elongation 25 per cent. in 8 in., and it is required that a test-piece shall stand bending 180 deg. flat on itself, without fracture. For medium steel the ultimate strength is fixed at from 60,000 lbs. to 70,000 lbs. per square inch, the elongation 22 per cent., and the bending test 180 deg. to a diameter equal to the thickness of the test-piece, without fracture on the outside of the bent portion. For rivet steel an ultimate strength of 48,000 lbs. to 58,000 lbs. per square inch is specified, with an elongation 26 per cent. in 8 in., and a bending test of 180 deg. flat on itself, without fracture on the outside of the bent portion.

Now in English practice there is usually



Interior of Buffet Parlor Car—Aurora, Elgin & Chicago.

take it to the nearest station in the next county.

If an employee or passenger is killed the company will pay the reasonable funeral expenses, for just such a funeral as the family would have if they were to pay for it. Don't ever tell an undertaker to spare no ex-

terior into two compartments, the smaller of which is a smoking room. There is room in the parlor compartment for six tables, three on each side, set staggered. Three persons can be seated at a table. Also there is space for two tables in the smoking end, so that 24 persons can be served at one time.

only one grade of steel used for structural purposes, and that grade corresponds very closely with the "medium" steel used in America; it is specified to have an ultimate tensile strength of from 27 to 32 tons per square inch, with an elongation, measured in a length of 8 in., of not less than 20 per cent.

It is also usual to specify a bending test, such that a specimen piece shall, when heated to a cherry red and cooled in water having a temperature of 82 deg. Fahr., bear bending double, when cold, round a curve, the diameter of which is not more than one-and-a-half times the thickness of the piece, without showing any signs of fracture. Rivet steel is, as in America, usually specified of a softer kind, and must have an ultimate ten-

lbs. per square inch, if properly manufactured, being looked upon as a highly satisfactory material for structural purposes. There is another argument also in favor of one-grade steel, which is, that by its adoption a more uniform practice all over the world may be established, and engineers who issue eccentric specifications will not receive much consideration from steel manufacturers.

Granting the advisability of adopting one grade of steel, the question has arisen among American engineers as to what is the proper grade of steel to use. Much discussion has taken place on the subject in the States, and most of the leading engineers there have expressed themselves on the subject, some arguing in favor of a continuation of the use of

and may be used with advantage for all structural purposes; for it can stand more abuse than the best double-rolled wrought iron, and can be punched and sheared with no greater injury than such treatment would inflict on the latter metal, if the thickness does not exceed $\frac{1}{2}$ in. We feel sure that American engineers are wise in having come to so important a decision.

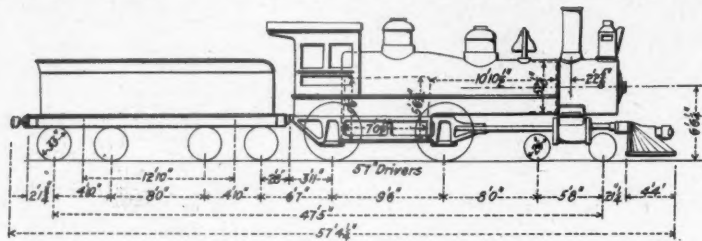
The Growth of the Missouri Pacific.

III.

(Continued from page 266.)

The improvements made on existing lines and the large amount of new construction which were briefly described in the previous article have taken nearly six years to complete, and by the end of this year the entire scheme will have been worked out, and with the exception of ballasting the new lines in some places, all of the lines will be in shape to carry heavy traffic. It has been the aim of the management to derive the benefits from these extensive betterments at the earliest opportunity, and each part of the system as it was reconstructed or opened for traffic has been utilized to the fullest extent to increase economy of operation. The work being so scattered, however, results have not as yet begun to show themselves beyond a steady increase in the average train load. As the new lines develop business and operating conditions become stable, the real value of the improvements will be felt.

It was necessary, in order to realize the full benefits of the grade reduction work, which was started in 1898, to provide modern heavy motive power for both freight and passenger service, and beginning with 1901 large additions were made to the motive power on the system. As fast as the improvements were completed and bridges and track brought up to standard, this new equipment was assigned, and the train loads increased correspondingly with the reduced



Weight, total	93,300 lbs.	Heating surface, flues	1,085 sq. ft.
Weight on drivers	61,700 lbs.	Heating surface, total	1,206 sq. ft.
Diameter of drivers	37-in.	Grate area	20 sq. ft.
Diameter of cylinders	19-in.	Tractive force	11,172 lbs.
Stroke of cylinders	22-in.	Boiler pressure	145 lbs.

Fig. 1—8-Wheel Passenger Engine, Standard in 1895.

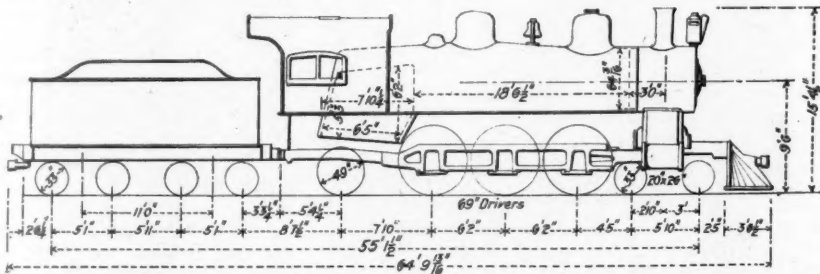
sile strength of from 26 to 30 tons per square inch. It must also be capable, when cold, of being bent double on itself without showing signs of fracture.

Of late years a feeling has grown up among American engineers that the "soft steel" usually mentioned in their specifications might very well be omitted, because the limits mentioned for the two classes of steel—both "soft" and "medium"—always overlapped in the higher limit for the "soft" steel and the lower one for the "medium," and because both grades of steel could be made from the same ingot, and were practically alike. The American Bridge Company fix the limit for soft steel at from 52,000 lbs. per square inch ultimate tensile strength to 62,000 lbs., and for "medium" steel from 60,000 lbs. to 70,000 lbs. Mr. Theodore Cooper specified, in 1901, a range of from 54,000 lbs. to 62,000 lbs. for "soft" steel, and from 60,000 lbs. to 68,000 lbs. for "medium" steel.

At a meeting of the American Society for Testing Materials, held at Atlantic City last year, the question as to the desirability of specifying a single grade of open-hearth structural steel for bridges of ordinary span was discussed by some of the leading bridge designers and builders, and the matter very fully gone into, with the result that the general opinion of these engineers appears to have been that it was desirable to specify in future only one grade of steel for structural purposes, rivet steel, of course, not being included in this. The wisdom of this decision will appeal to English engineers who in their practice have always been satisfied with one grade of steel, having an ultimate tensile strength ranging from 27 tons to 32 tons per square inch.

Another argument in favor of the adoption of one grade of steel in America appears to be that at present a large percentage of the structural steel is made by the basic process, and it seems probable that this process will be the one of the future for ordinary structural steel. There is a prejudice against basic steel in certain quarters in this country, which prejudice we do not consider is supported by facts; but in America no such feeling exists; basic steel, having an ultimate strength of from 58,000 lbs. to 60,000

two grades of steel, while others (and they the majority) advocate strongly the adoption of only one grade, and that of the higher quality. After all, however, when the views of these men are examined and compared, there seems to be a wonderful unanimity. The prevailing impression left in the mind is that it is a case of Tweedledum and Tweedledee, and that the most suitable steel to adopt is one having an ultimate average tensile strength of about 60,000 lbs. per square inch. The other properties of the material, such as the yield point, and the



Weight, total	185,000 lbs.	Heating surface, flues	2,779 sq. ft.
Weight on drivers	118,000 lbs.	Heating surface, total	2,954 sq. ft.
Diameter of drivers	69-in.	Tractive force	25,623 lbs.
Diameter of cylinders	26-in.	Boiler pressure	200 lbs.
Stroke of cylinders	26-in.	Grate area	42.37 sq. ft.

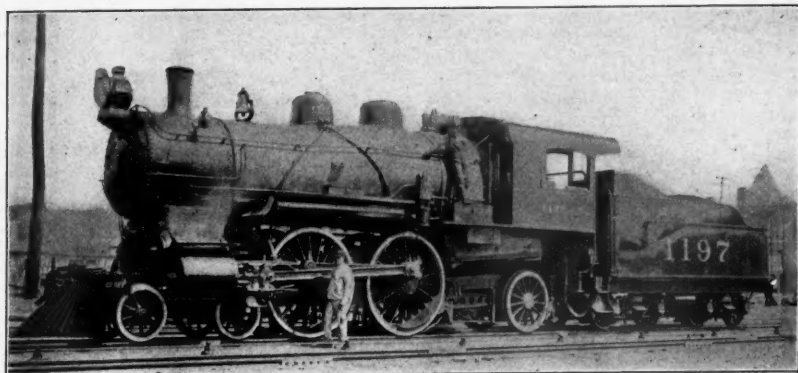
Fig. 2—Pacific Type Locomotive for Heavy Passenger Service.

percentage of elongation, to be fixed to suit this range of tensile strength.

The preceding figures do not refer to rivet and pin steel, the former having to be soft and ductile, particularly for rivets put in during erection, and ranging between 50,000 lbs. and 58,000 lbs. ultimate tensile strength per square inch; while the pin steel must be quite hard, with a tensile strength between 75,000 lbs. and 85,000 lbs. per square inch.

The decision arrived at by the American Society for Testing Materials has been that a one-grade steel having an ultimate strength of from 55,000 lbs. to 65,000 lbs. per square inch, is, on the whole, very desirable; and that this decision will no doubt bear fruit, to the advantage both of the manufacturer and the consumer. It has been clearly demonstrated that such steel is quite reliable,

grades and increased hauling power of the engines put in service. The accompanying drawings show the standard types of freight and passenger engines in use prior to 1899 and at the present time. Fig. 1 shows the standard 8-wheel passenger engine in use prior to 1895. Somewhat heavier engines of the same type were in use up to 1899, but these have since been replaced on all important trains with the Pacific type engines shown in Fig. 2, and with the Atlantic type engines shown in Fig. 3. Most of the old light engines have either been sold, scrapped or assigned to local trains on branch lines. Fig. 4 shows the standard 10-wheel engine for heavy freight service which was in use up to 1899, and in comparison with it, the 12-wheel engine in use to-day is shown in Fig. 5. The latter has nearly double the



Weight, total	184,000 lbs.	Diameter of drivers	79-in.
Weight on drivers	100,000 lbs.	Graze area	45.8 sq. ft.
Diameter of cylinders	20-in.	Tractive force	24,670 lbs.
Stroke of cylinders	26-in.	Boiler pressure	200 lbs.

Fig. 3—Atlantic Type Engine for Fast Passenger Service.

tractive power of the former. The following table shows the increase in motive power during the last five years.

Locomotives Owned by the Missouri Pacific System in 1899 and 1904.

Year.	1904.	1899.
0-6-0	96	62
4-4-0	150	192
4-4-2	15	..
2-6-0	96	97
4-6-0	314	183
4-6-2	21	..
2-8-0	217	85
4-8-0	19	..
Total	928	619

It will be noted that the largest increase is in the consolidation and 10-wheel types, these classes of engines being used almost exclusively for heavy and fast through freight service respectively.

Equally important and extensive additions to the rolling stock of the system have been made during the last five years to care for the large increase in business which has come about through the development of the territory traversed. The following tables show the equipment in service in May, 1899, and in May, 1904:

Capacity.	Flat		Gondola		Box		Furniture	
	1904.	1899.	1904.	1899.	1904.	1899.	1904.	1899.
15	179	435	491	547	1,047	1,914	..	..
20	295	747	3,380	3,722	5,540	6,272	..	..
25 .....	..	245	111	11	311	159	..	..
30	1,778	519	3,763	1,779	18,240	6,094	1,019	484
40 .....	..	..	1,465	..	..	..	..	..
50 .....	..	..	500	..	..	..	..	..
Totals	2,257	1,725	9,719	6,050	25,138	14,439	1,019	484

Passenger Equipment.

	1904.	1899.	Increase.
Baggage	105	64	41
Coach and baggage	28	32	..
Baggage and mail	58	38	20
Mail	37	35	2
Coach and mail	16	13	3
Coach baggage and mail	23	22	1
Coach	269	193	76
Chair	67	57	10
Dining	15	..	15
Cafe	2	..	2
Sleeping	58	65	..
Special	23	17	6
Total	701	536	165

The totals in the above tables include all of the Missouri Pacific leased and operated lines.

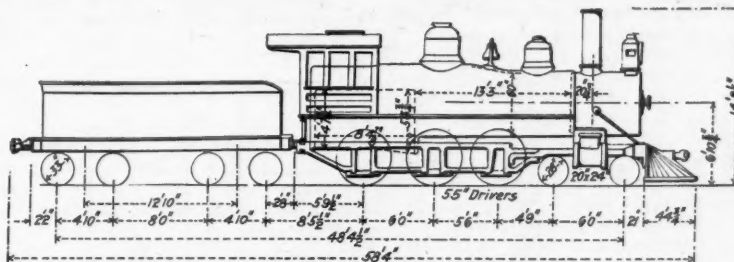
In the five years between 1899 and 1903, inclusive, the Missouri Pacific spent \$4,028,000 on new motive power and \$14,560,000 on new freight equipment to take care of the new business which was being developed and to replace old and wornout rolling stock. Some of the money for this purpose was drawn directly from income, but most of the new rolling stock has been bought through car trusts. Equipment for the Missouri Pacific and branches is secured through the Missouri Pacific Equipment Association, and for the Iron Mountain

and branches through the Iron Mountain Car Trust. The total amount of the notes outstanding on Dec. 1, 1903, was \$11,759,800, divided about equally between the two associations. Payments on these notes are made out of income and are not charged to capital account.

In order to care for this new and constantly increasing equipment, the very inadequate shop and engine terminal facilities have been greatly enlarged at several of the most important points. New brick engine houses and repair shops have been built at Van Buren, Ark.; Kansas City, Mo., and Coffeyville, Kan. The principal repair shops

of the Iron Mountain at Baring Cross, Ark., just across the river from Little Rock, were destroyed by fire in 1901, and have since been entirely rebuilt. The buildings are of brick and the new shops are modern in every respect. All of the heavy repairs to engines on the Iron Mountain are now done at this point, and the car repair shop is also located there. The main shops of the Missouri Pacific at St. Louis are old and not capable of handling the heavy repairs to engines on that part of the system. Work is now in progress on new shops at Sedalia, Mo., which will cost more than a million dollars. When they are completed, all the heavy repairs now done at St. Louis, Osawatimie, Kan., and at the present shops at Sedalia will be done in the new shops, and the shops at the two first mentioned points will be used for light and running repairs.

The mechanical department has been slowly carrying out a scheme of standardization in the rolling stock of all of the lines included

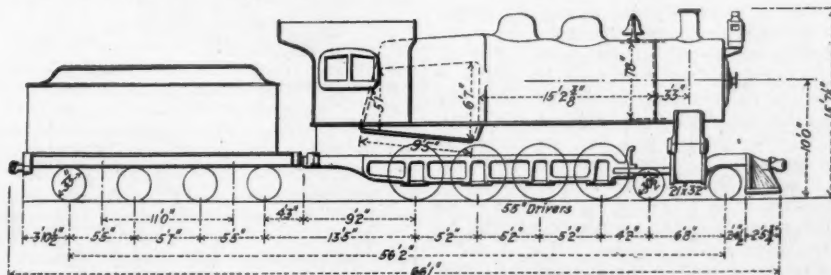


Weight, total	126,800 lbs.	Heating surface, flues	1,751 sq. ft.
Weight on drivers	100,450 lbs.	Heating surface, total	1,888 sq. ft.
Diameter of drivers	55-in.	Graze area	22.5 sq. ft.
Diameter of cylinders	20-in.	Tractive force	23,740 lbs.
Stroke of cylinders	24-in.	Boiler pressure	160 lbs.

Fig. 4—10-Wheel Freight Engine, Standard in 1899.

in the system. This includes not only the general design, but as far as possible all of the details of car and locomotive construction. The standard box car, for instance, is now of the American Railway Association standard inside dimensions, with a capacity of 60,000 lbs. For the general traffic on the system this has been found the most economical and satisfactory class of box car, and large numbers of them have been built during the last five years. The 273 locomotives received since Oct. 1, 1901, were fitted with seven different styles of cross-head centers and five styles of gibs. They have all since been fitted with one style of cross-head and two styles of gibs, and similar standardization has been accomplished in other details. All of the supplies for this and other departments are purchased by and accounted for on the books of the Missouri Pacific Railway Company, and charged to the accounts of the leased or operated lines when given out on requisitions. This makes only one set of supply accounts necessary.

(To be Continued.)



Weight, total	208,200 lbs.	Heating surface, flues	3,127 sq. ft.
Weight on drivers	172,000 lbs.	Heating surface, total	3,363 sq. ft.
Diameter of drivers	55-in.	Graze area	62 sq. ft.
Diameter of cylinders	21-in.	Tractive force	43,622 lbs.
Stroke of cylinders	32-in.	Boiler pressure	200 lbs.

Fig. 5—12-Wheel Engine for Heavy Freight Service.

The size of the drill used is $\frac{3}{16}$ in. and the depth of the hole is $1\frac{1}{2}$ in. In the hands of a skillful operator six bolts a minute can be drilled on the machine. The entire process of preparing and applying the bolts is as follows: The iron is first cut off 1 in. longer than is required. The tell-tale holes are drilled and the threads cut, after which the bolts are nicked in a machine at the proper length for cutting off. They are then screwed into place in the sheets from the fire-box side with a special chuck, after which the nickel ends are broken off with a hammer and the ends of the bolts peened.

The stay-bolt drilling machine was designed by W. H. Mulcahy, one of the department foremen at Omaha. He has applied for a patent on it.

Lightning and Automatic Block Signals.*

BY H. S. BALLIET.

The most annoying interruptions to automatic block signals in summer are those due to induced lightning discharges, which destroy fuse wires and the windings of electromagnets. Sometimes these discharges are of sufficient potential and volume to heat the relay points and contacts so that they become fused together. Still another effect is the melting of line and other wires controlling the circuits. The total number of interruptions of the track circuit, due to a heavy downpour of rain or continued wet weather; broken bond wires; defective relay magnets; poor zinc in track batteries; exhausted track batteries and many other possible causes, is usually less than the number chargeable to induced or direct discharges of lightning.

Before describing some of the methods employed in an effort to reduce these interruptions, it may be well to consider their origin. Lightning is only the discharge of a Leyden jar on a large scale—a scale on which Nature often performs her operations. The air is almost constantly electrified by the friction of moving clouds and winds, and by heat and chemical changes, all of which disturb its equilibrium. The discharge of opposite electricities between two clouds separated by non-conducting air has no effect upon electrical circuits near or beneath the surface of the earth, because when the tension becomes sufficient to overcome the resistance introduced by the air between the clouds the two forces rush together with a flash, but the discharge will not be felt beyond the cloud line. If, however, the attraction between the positive electricity of the clouds and the negative electricity of the earth is of sufficient tension to overcome the resistance of the intervening air gap, there will be a discharge just above the earth's surface, or objects thereon. These discharges generally take place where there are large bodies of water either on or close to the surface of the ground, or in swamps, and on certain trees, principally oak and elm. Few cases are recorded where signal or track circuits, signal posts or poles carrying line wires for signal purposes have been in line of such a discharge; for, generally speaking, there is some nearby object which has a better ground connection. It is only the induced electrical action that manifests itself on the wires.

A good illustration of the effects of the electricity drawn up by induction from earth to the clouds and not vice versa, is shown by Benjamin Franklin's famous kite experiment in Philadelphia in 1752. In his experiment,

the electricity flowed from the earth over the Leyden jar and key attached to the kite string, as indicated by the sparks created at the gap between the jar and key. As early as 1750, Franklin began experimenting with lightning rods with which to protect dwellings, barns, churches, etc. A letter written by him to a friend, dated July 29, 1750, refers to an opinion formed by him. He wrote:

"... By directing us to fix on the highest points of those edifices, upright rods of iron made as sharp as a needle, and gilded to prevent rusting and from the point of these rods a wire run down the outside of the building into the ground or down round one of the shrouds of the ship, or down her side till it reaches the water. Would not these points probably draw the electrical fire silently out of the cloud before it came high enough to strike and thereby secure us from that most sudden and terrific mischief?"

This is the first recorded suggestion of a lightning rod and it will be noticed that the function of silent restoration suggested was merely a supposition and not an established fact. As a matter of record, it may be of interest to note that Franklin erected the first lightning rod on his house in Philadelphia in the month of September, 1752. He did not depend on the results to be achieved by making periodical examinations of the rod and its point after lightning storms in order to note the effect upon them, but by means of bells connected to these rods, he observed the induced effects during the progress of the storm. Franklin anticipated many of the theories which are to-day accepted as the proper interpretation of the mysteries surrounding lightning discharges.

The atmospheric phenomena attending electrical storms are well defined in Mr. H. W. Spang's book entitled "Perfect Railway Signaling." He classifies them as follows:

1.—"A terrific lightning discharge in a somewhat concentrated form usually between a high cloud and a body of water or an isolated object upon the earth, and especially in line with an underground water or gas main, railroad tracks, wire fences and overhead and underground electrical circuits, the discharge being attended usually with great destruction."

2.—"A lightning discharge in its greatly diffused form usually in connection with a low cloud and great rainfall and by numerous ramifications in line with a forest or a number of buildings or objects, especially those located in rural districts where there are no long metallic conductors."

3.—"Small discharges which take place in connection with electrical circuits, simultaneously with a concentrated or diffusive lightning discharge, and especially when taking place between the clouds and the earth within a distance of about three miles of an electrical current."

4.—"Small discharges upon electrical circuits arising from a greatly increased air potential and without a lightning discharge, sometimes produced by high wind, and especially in connection with sand, dust and snow storms, escaping steam from a locomotive, etc., or induced thereon by powerful electrical currents upon adjacent electric light and other similar lines. These are usually known as sneak currents and are sometimes of sufficient intensity to fuse the fine wires of telephone, telegraph and other similar apparatus."

Observations taken at various points along different railroads indicate that signal circuits running east and west are disturbed for greater distances than those running north and south. Occasionally a storm will extend parallel with a north and south circuit, but these exceptional cases seem to be confined to wires of great length. It is an

easy matter to demonstrate this by comparing the difference in the discharges from the various line wires comprising an overhead line circuit signal system, as registered on an ordinary saw tooth arrester. If the common return wire is from 15 to 30 miles in length, the induced lightning on it keeps up a continual sparking, whereas, the indicator home and distant controlling circuits only show a spark of a flash at infrequent intervals. By a careful study, one may closely estimate the length of the common return wire, as compared with the shorter circuits, by noting the intensity and frequency of the discharges.

Signal circuits (not track circuits) are sometimes operated by using the ground for the return; there again is opportunity for comparison—lightning discharging more readily to such circuits than to those before mentioned. Where signal circuits are run from the line underground either through cable or rubber insulated wire, there is greater susceptibility to lightning discharges. Defective insulation in underground wires is often due to lightning discharges to earth. After the discharge has broken through the insulation, electrolysis sets in and destroys the wire. These breaks are not easily located, though if corrosion has not set in, the insulation remains intact and the break can usually be located with a galvanometer or portable Wheatstone Bridge. I have never known of a case where the discharge arced to the earth through the rubber insulation of the wires connecting the rails to the relay magnets. On underground connections to the rails corroded wires are rarely found. On some railroads the number of feet of wire in use for track circuit connections and for line connections is about equal; and, generally speaking, not more than two corroded wires will be found in track circuit in a year (these probably due to kinks) against about 50 in the signal wires.

Some good judges claim that direct lightning discharges, damaging to electrical circuits, are increasing year by year, and that they are becoming more destructive. An experience extending over a period of ten years in an extended territory does not confirm these assertions. Lightning discharges, or more properly the induced effects, are irregular, and we have no records that indicate their frequency. The season of 1904 is, from records available, the most troublesome in the past five years. Our most frequent difficulty is that due to small discharges. These do not usually destroy apparatus, but where the fuses are from 0.3 to 1.0 ampere capacity, they are burned out, signals fail to clear, trains are delayed.

Frequently lightning is traceable on track circuits; as near as can be determined, this condition is most likely to occur before the rain falls and while the ground connection to higher objects is poor. Rarely is a case reported in which apparatus connected with the track circuit is deranged after the rain has begun to fall.

(To be continued.)

At a meeting of the Swiss Natural History Society recently a member of the Council of the Confederation, Mr. Sulzer-Ziegler, in a lecture on the geological survey for the Simplon Tunnel and the practical experience in excavating it said that if the geologists, basing their opinions on the experiences in excavating the Mont Cenis, the Aarberg and the Gotthard tunnels, had not made such positive statements on the character of the rocks, the temperatures, etc., which would be encountered in the Simplon Tunnel, that great work would probably never have been undertaken; at least it would not if the difficulties actually encountered had been suspected. Difficulties altogether unanticipated

*Articles by Mr. Balliet on the performance of automatic signals under unfavorable conditions were published in *The Railroad Gazette*, of Feb. 26, March 25, April 15, May 20, July 1, July 8, and Sept. 2.

five different times threatened to put an end to the enterprise. Among the most formidable of the obstacles was the pressure from the sides inward and from the bottom upward in a certain section of the south end. Great oak timbers used to resist this pressure were bent, split and broken like matches, and heavy T beams with which they were replaced were sometimes bent. The greatest danger to the workman was where the rock was soft or decomposed. The harder the gneiss or granite the more safely and also the faster the excavation advanced. At a distance of 32,700 ft. from the south entrance, the supports had to be advanced for every inch of advance in excavation. The geologists had announced a maximum temperature of 118 deg.; the actual maximum was 131 deg. The drainage of the great springs was another serious obstacle, gushing out at the rate of 240 gallons per second; but worst of all were the hot springs, which compelled the abandonment of drilling on the north end after the summit had been passed, pouring out a great stream at a temperature of 151 deg. to 162 deg. When the two headings were yet nearly 2,000 ft. apart, the blasts at the north could be heard at the Italian end; and it is believed that this indicates solid rock between, which is encouraging.

New Cars for the Central South African Railroad.

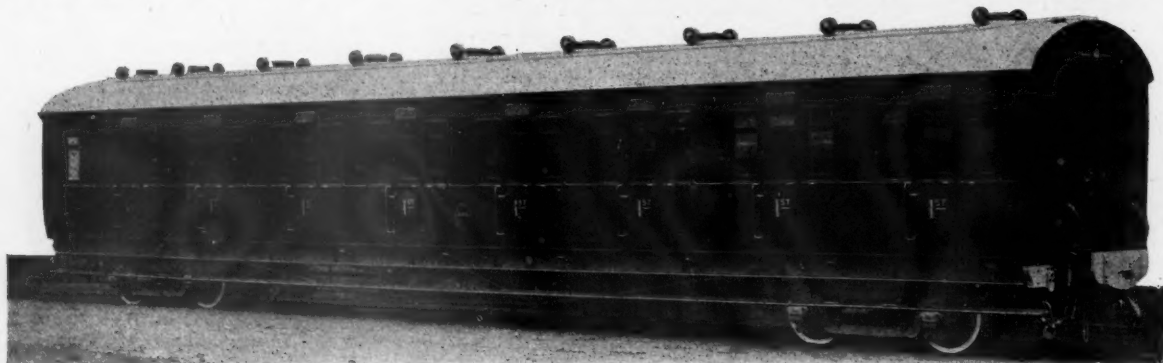
During the past eighteen months some extensive orders have been placed in Great Britain for new rolling stock for the Central South African Railroad, to replace that which was damaged or destroyed during the recent Boer war, and also with the aim of

order a large number of new cars, suitable for the traffic which was to develop. Orders were accordingly placed for a number of cars of two types; a high-sided steel gondola of 60,000 lbs. capacity and a tare of 30,500 lbs.; and a pressed steel hopper bottom coal car of 60,000 lbs. capacity and a tare of 29,600. The cars of the first type were built in Great Britain, and the cars of the second type were built in the United States. These orders were immediately followed by an order for 1,250 more of the gondolas with a capacity of 70,000 lbs. Of these, 1,000 were built of structural shapes and have a tare of 30,200 lbs., and the remaining 250 cars were built of pressed steel with a tare of 29,200 lbs. As the number of unloading platforms suitable for hopper cars was increased, additional orders were placed for 100 cars of this type, built of structural shapes, and 150 cars

each side, are hinged at the top and incline out toward the side of the car. They are held closed by a pair of toggle links at each end of each door, which extend across under the bottom of the car. These toggle arms are connected at their joint in the center with a short vertical toggle link fastened to an arm keyed to the longitudinal shaft. When the crank arm on the side of the car is turned, the longitudinal shaft is revolved and the short toggle arms are bent together. This draws the door toggles up in the center and allows the doors to swing in and give any desired opening for discharge. When the doors are fully closed the toggle arms lock themselves. Before being shipped to South Africa, one of these cars was loaded with a test load of 240,000 lbs., and received no permanent set or injury in any way as a result. The satisfactory results obtained



40-Ton Steel Hopper Coal Car for the Central South African Railroad.



First Class Corridor Car for the Central South African Railroad.

dealing more economically with the rapidly increasing traffic between the seaports of Natal and the extensive mining properties in the Rand. Operating conditions in the Transvaal and Orange River Colonies are more nearly like those found in America than those which are to be met with in Great Britain. The haul is long, the consignments are in large bulk as a rule, the clearance limits are large, and many of the mines which receive and ship large quantities of freight have arranged their loading and unloading platforms and plant to suit the requirements of high-capacity cars of modern design. The track is 3 ft. 6-in. gage, which is standard in South Africa, and is laid for the most part with 60-lb. rails of Vignoles section, although in some places there are stretches of 52-lb. rail. Good ballast, in plentiful quantities, is obtainable, and the rails are laid on steel and wood sleepers. Much of the 60-lb. rail is now being replaced with 80-lb. rail.

While the line was still under military administration during the latter part of the war it was seen that more rolling stock would be required, and it was decided to

of pressed steel. This last type of cars have a capacity of 80,000 lbs. and a tare of 36,500 lbs.

The accompanying illustration, Fig. 1, shows one of these latest 80,000 lb. pressed steel hopper cars which are just being put into service. They have the following dimensions: Length over buffers, 39 ft. 3 in.; length inside, 36 ft. 5½ in.; width inside, 7 ft. 5½ in.; height from top of rail, 9 ft. 9 in.; center to center of trucks, 25 ft. 6 in.; cubic capacity, 1,428 cu. ft.; ratio of dead load to paying load, 45.6 per cent. These cars were built by the Leeds Forge Company, Leeds, England, and are fitted with Fox pressed steel underframes and trucks, and Central South African standard draw and buffing gear. They have longitudinal hopper doors operated by a form of gear which locks automatically when the doors are closed. The operating gear consists of a transverse shaft in the center of the car, which can be turned with a socket crank from either side of the car. This shaft is geared through a worm and wheel to a longitudinal shaft mounted between the center sills. The discharging doors, two on

from the high-capacity cars now in service have led the management to decide upon the adoption of 100,000-lb. cars with a tare of 39,400 lbs. and a length over all of 38 ft. 9 in. for handling the rapidly increasing coal traffic.

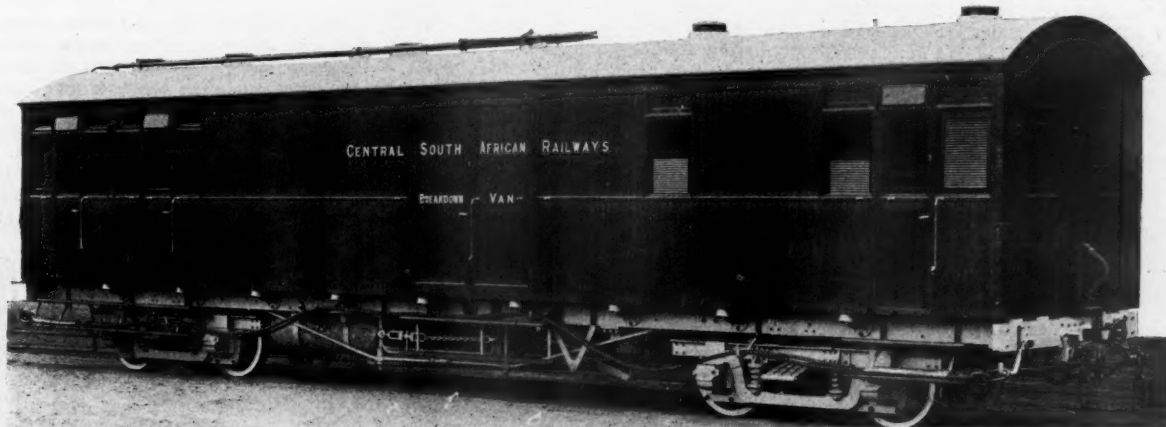
In addition to a large number of passenger cars for through trains, which were ordered some time ago, the Central South African has also ordered a number of first and third-class corridor coaches for local and suburban service in the Rand. One of the first-class coaches built by the Gloucester Railway Carriage & Wagon Co., of Gloucester, England, is shown in Fig. 2. These cars are 60 ft. 1¼ in. long over body, 59 ft. 9 in. long over underframe, 6 ft. wide over underframe, 9 ft. 1¾ in. wide over body, 11 ft. 1 in. high from top of rail, 2 ft. 10¾ in. from top of rail to center of buffers, unloaded. They have steel channel and angle bar underframes, stiffened with truss rods, and are mounted on steel frame equalized trucks with teakwood bolsters, which are very similar to the usual practice in the United States. The wheels have open spoke wrought-iron centers and steel tires, and the

journals are $4\frac{1}{4}$ in. x 9 in. The body of the car is framed with teak with steel panels. It is divided into eight compartments seating eight persons each, with an open corridor running through the center. A lavatory is placed at each end of the car and the main water supply is carried in tanks slung under the car, from which it is pumped as required into service tanks fixed in the roof over each lavatory. The cars are heated by steam with a heater coil under each seat, and are lighted throughout with electricity generated from the axle; oil lamps are also provided in each compartment.

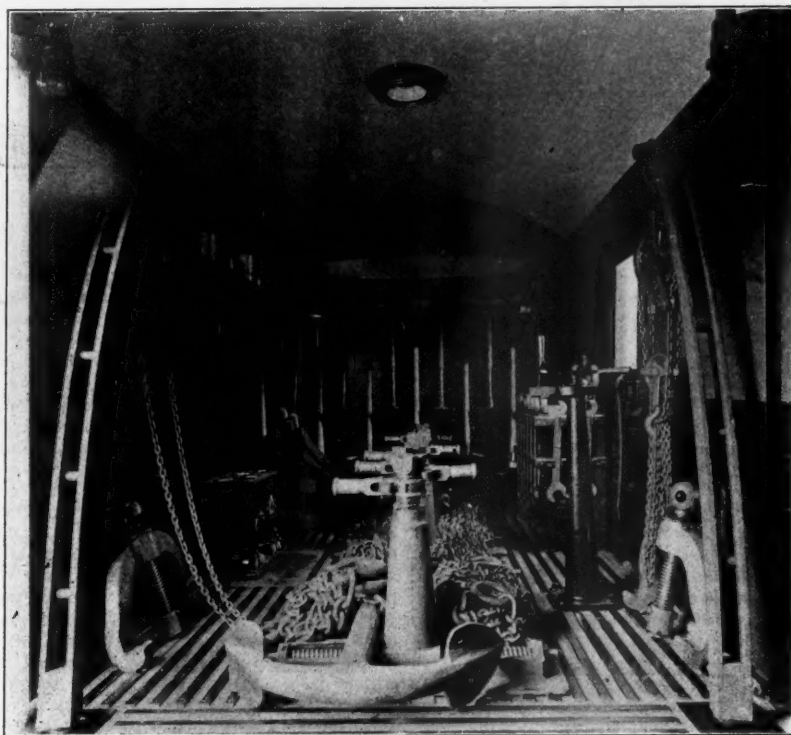
compartments are finished in the plainest manner, being lined with painted matchboarding and polished teak mouldings; the seats are plain deal, painted. These third-class cars weigh about 56,000 lbs., and the first-class cars weigh about 64,000.

The Gloucester Railway Carriage & Wagon Company has also furnished the Central South African with a number of breakdown vans or wrecking cars, one of which is shown in Figs. 3 and 4. They are 45 ft. $1\frac{1}{4}$ in. long over body, 45 ft. long over underframe, 6 ft. wide over underframe, 8 ft. 3 in. wide over body, and 11 ft. $11\frac{1}{2}$ in. high from

hydraulic jacks of from 10 tons to 30 tons capacity, a heavy anchor for holding guy ropes and tackle, chain cables, hooks, sheave blocks, rail benders, shovels, picks, axes, mauls, sledges, saws, sets of spanner wrenches, car replacers, and numerous small tools, including a Wells light for night work. Wire cables are slung on hooks on the underframe outside the car, and a cradle underneath the floor carries a supply of 9-in. x 4-in. blocking. In the tool compartment there are also a stretcher, two surgical chests containing instruments and drugs, a medicine cupboard, cook stove and work bench with



Breakdown Van or Wrecking Car for the Central South African Railroad.



Tool Compartment in Wrecking Car.

The interior finish is plain and simple, to prevent the accumulation of dust. All of the woodwork is polished teak and the ceiling is lined with lincrusta tinted a light coffee color. The seats are upholstered with dark-green buffalo hide without buttons, and the floor is covered with linoleum with carpet rugs between the seats.

The third-class cars have six compartments and will seat 72 persons. They also have a baggage compartment with two doors and a guards' compartment. The passenger

top of rail. They are divided into three compartments, a sleeping compartment at one end for the white men, a workshop and storeroom for tools in the center, and a double compartment at the other end for the Kaffir laborers. The tool compartment has large double folding doors on each side, and at each door on the inside of the car is mounted a jib crane with a 1-ton chain block hoist, which may be swung out to the side of the car. The equipment also includes an assortment of traversing screw jacks and

vise and the necessary tools carried in racks. The body of the car is framed with teak with matchboards of the same material on the exterior, and inside lining boards of red deal. The car is lighted with oil lamps and weighs about 50,000 lbs. All of the company's new rolling stock, both freight and passenger, is fitted with automatic vacuum brakes, and the passenger cars all have automatic couplers.

Telephones on Railroad Telegraph Lines.*

The Chicago, Milwaukee & St. Paul has experimented between Chicago and Milwaukee, 80 miles, on copper and iron metallic composite systems, which experiments at first were not entirely satisfactory, due to the natural impedance in the underground cables in the cities of Chicago and Milwaukee. This disturbance, however, was overcome by the substitution of a twisted pair of wires through the telephone company's underground cables. This circuit is carried on a pole line with all kinds of simplex and multiplex telegraphs where the disturbances are greater than in any other locality except New York city.

The Lehigh Valley has a specially constructed and fully transposed copper metallic composite circuit between Jersey City and South Bethlehem, 90 miles. The same road has two composite single line circuits; one 14 miles in length with four intermediate telegraph offices. It is equipped with the American Telephone & Telegraph Company's magneto ringing composite, No. 227, the wire being No. 9 iron, 94 miles long with the telephone introduced in the center. There are four adjoining telegraph wires on the poles, but no multiplex systems, electric light or power line disturbances in the field.

The second grounded circuit on the Lehigh Valley covers a distance of 43 miles with five intermediate offices equipped with

*From Committee Report on Composite Circuits made to the Association of Railway Telegraph Superintendents at Indianapolis.

the American Telephone & Telegraph Company's ringing composite, known as No. 236, on a No. 9 iron wire, 105 miles long, with two telegraph wires on the same poles for the greater portion of the distance, and six to seven wires in a distance of ten miles. The composite was introduced at the northern end of the line where there are no disturbances. Both of these circuits are working satisfactorily.

The Chicago, Burlington & Quincy has, during the past year, made quite a considerable use of the railroad composite apparatus, and the results have been reasonably satisfactory. The first circuit installed connected a transfer point with a trainmaster's office, 23 miles distant, and soon after this circuit was extended to the end of the division, making the circuit 69 miles long. There are on the poles carrying this line, from 17 to 28 wires, nine of them quadruplex circuits. The wire in use is a single telegraph circuit.

Another Burlington circuit that is working satisfactorily, connects the division superintendent's office and master mechanic's office at the division headquarters with an important junction point 24 miles distant, and with the division terminal, 31 miles further on. This circuit has recently been extended by hooking up another instrument distant 49 miles still further on on a different wire; the two wires being connected together through a condenser. This makes the total length of the circuit 104 miles. The line is employed largely as a means of general communication, and from blind sidings it is used by trains which may require help from the despatcher. There are 13 wires on the poles through most of this territory, five of them being quaded wires.

The Burlington has three circuits radiating from a division headquarters, all three being hooked together by means of condensers. Two circuits connect the division headquarters with blind sidings, one circuit being 40 miles in length, the other 37. The third circuit is 74 miles long. All instruments work with one another without trouble. On the poles carrying these circuits, are from seven to 12 wires, the maximum number of quaded wires being four.

Some time since the Burlington road equipped a pile driver with two sets of instruments, and as it was necessary that signals be passed both ways, two sets of style No. 236, were used. The seven cells of Edison battery for each instrument were placed in a tray with handles to facilitate handling, the cells being sealed with paraffine wax. The results obtained were so satisfactory that the road named will make considerable use of the scheme in connection with work trains. It is hoped, however, that our friends, the telephone companies, will develop a set of instruments capable of receiving signals and still be a little more portable than the No. 236 type above mentioned.

Recently the Burlington had a bad bank slide which required several weeks' use of the steam shovel to repair damage. In this instance the telephone was employed in place of the telegraph to control the movements of the work train.

All the circuits of the Burlington road are on iron wires. Experiments with copper wires have indicated that better transmission for greater distances can be secured through their use, but all copper wires are quadruplexed, and as some little disturbance was felt on the quads through efforts to use them for telephone purposes, no regular use is now being made of those circuits.

The Erie has, perhaps, the longest single line composite system in operation up to the present time. In August, 1903, an installation was completed between Cleveland and Galion, with intermediate telegraph and telephone offices at Leavittsburg, Kent and

Akron, or five stations in all. One of the wires used was a No. 11, or 210-pound copper wire, worked single between New York and Chicago, 1,000 miles, with a side line composed of a No. 8 iron wire through a repeater at Leavittsburg, thence 50 miles to Cleveland. This No. 8 iron wire between Leavittsburg and Cleveland was used as one side of the circuit in the original experiments. The second wire was composed of 174-lb. copper wire extending as a telegraph circuit from Cleveland to Chicago via Leavittsburg, 459 miles. Both wires passed through two miles of underground cable in Cleveland. The American Telephone & Telegraph Company's No. 227 hand generator ringing sets were used, polarization cells were bridged around intermediate relays, and flat condensers around intermediate offices.

It was impossible to get good commercial talk from Cleveland to Galion, 169 miles, or from Cleveland to Akron, 87 miles, although it was good from Cleveland to Kent, 61 miles, and to Leavittsburg, 50 miles, notwithstanding the unbalanced condition of the wires. A test made from Newburg, Ohio, four miles

parallels the Erie wire for about one-half mile and "cross talk" was audible on May 3, 1904, but not of sufficient volume to destroy the privacy of the circuit.

It is the sense of your committee that the composite system is of considerable value as an auxiliary to the telegraph in railroad service, under favorable conditions; that, in its present stage, it is limited to one circuit on any one pole line and cannot be considered as a satisfactory intercommunicative system worked in connection with a public or private branch exchange.

A New Pipe Cutter and Pipe Wrench.

The accompanying illustrations show two new tools recently put on the market by the Headson Tool & Manufacturing Company, Lafayette, Ind. The Headson pipe cutter is illustrated by Fig. 1, which is from a photograph of a sectional model of the tool so as to show the details of its construction. The object of this cutter is to do away with the necessity of reaming the inside of the pipe to remove the burr formed by the usual types.



Fig. 1—The Headson Pipe Cutter.



Fig. 2—The Headson Pipe Wrench.

beyond the underground terminal in Cleveland, gave very fair transmission to Galion, 163 miles, but the disturbances on the telegraph side from ringing and the inequality of the two wires caused the Erie to change on Oct. 15, 1903, to a grounded circuit; building up such circuit to consist of 174-lb. copper wire the entire distance except through cables.

The hand generator ringing sets, No. 227, were exchanged for the battery ringing type, No. 236, with seven cells of type BB Edison battery. This arrangement eliminated the disturbances on the telegraph and gave the Erie a satisfactory talk from Cleveland to Galion, 169 miles; but they could not find an adjustment of the ringing apparatus which would enable them to ring Galion from Cleveland, although intermediate stations could ring each other.

The frequent punctures of condensers by lightning was very considerably reduced by the substitution of Argus lightning arresters, and the Erie now has a fairly reliable telephonic communication for 169 miles, using the telegraph to call the distant terminal to the telephone and relieving the telegraph side of conversation which used to tie up the telegraph wire an hour at a time.

The conditions surrounding the Erie circuit are as follows: Two miles of underground cables; 48 miles of poles carrying 37 telegraph wires used in simplex, multiplex and automatic telegraph systems; 119 miles of pole line carrying seven telegraph wires with no electric light or power transmission wires paralleling. A composited wire belonging to the Cleveland, Akron & Columbus

of wheel cutters. Furthermore, the pipe is cut squarely without crushing or otherwise damaging the material of the pipe. The cutter consists essentially of a high grade tool-steel cutting tool, (o), fastened rigidly to the tool holder (4) by means of the cap and screws, (7). The tool holder is free to slide back and forth in the holding block (3), its motion, and hence the feed of the tool, being controlled by turning the handle (6) which is rigidly fastened to the feed rod. The tool is adjusted to the pipe by merely pushing forward on the handle until the anti-friction rolls, which guide the cutting tool, come in contact with the pipe, after which a slight turn of the fluted handle (5) brings the pipe in firm contact with the jaws (10) and the rolls. The cutter is then operated in the usual manner, the tool being gradually fed in by means of the feed rod which passes through the hollow rod controlling the motion of the holding block (3). The cutter can be opened to its full width by releasing the split nuts at the rear of the main frame and pulling back on the handle. It is claimed that the cutter also saves a good deal of time owing to the ease with which it can be adjusted and to the finished character of the work which it does.

The Headson pipe wrench shown in Fig. 2 is simple in construction and quick of adjustment. The handle is merely moved forward to adjust the jaws to any size pipe. A firm grip is obtained, it is impossible to crush the pipe, and the wrench does not stick. The inserted jaw in the handle can be replaced if necessary and all parts are made of drop forged steel and are interchangeable.

GENERAL NEWS SECTION

THE SCRAP HEAP.

Beginning September 3, 15 miles of the Wabash, between Romulus and Delray, Mich., near Detroit, will be used by the Cincinnati, Hamilton & Dayton for its Cincinnati-Detroit passenger service, forming a short route between these cities.

Announcement has been made that after September 1 the Harriman Lines will not haul shipments of the Utah Fuel Company. This is a Gould concern operating in connection with the Colorado Fuel & Iron Company and the Denver & Rio Grande.

The Colorado & Southern is to abandon the use of checks in paying employees, and the paymaster will pay cash. The men have often had some difficulty in getting checks cashed, and it is said, also, that there has been some annoyance from raised checks.

On the Shamokin division of the Philadelphia & Reading an order has been issued requiring enginemen, firemen, conductors and certain other employees to submit to a medical examination; and, according to the newspaper report, such an examination is to be held hereafter once a year.

A run was made over the suburban lines of the Pittsburgh Railways Company, September 4, to test portable street car telephones on suburban lines. Each car carried a portable telephone enclosed in a small box. There was a long distance outfit with transmitter and receiver. At a number of points along the route a hanging "jack" was attached to the trolley poles. Connection was made by inserting the plug from the portable telephone in the jack.

Two Train Disasters in Canada.

On August 31 a butting collision of passenger trains on the Grand Trunk near Richmond, Quebec, resulted in the death of nine and the injury of 23 persons. One of the killed was the express messenger; all of the others appear to have been passengers. The southbound train was an excursion of 11 cars from Montreal bound for Sherbrooke, and the northbound was regular passenger train No. 5. It is said that the excursion had left Richmond contrary to orders.

On the Canadian Pacific at Sintaluta, 300 miles west of Winnipeg, on the night of September 1, the westbound Imperial Limited express was wrecked by running over a misplaced switch and colliding with a freight train. Five passengers were killed and four passengers and one trainman were injured.

Plant Trees for Fence Posts on the Fort Worth & Denver.

General Freight Agent W. F. Sterley, of the Fort Worth & Denver, is engaged in an effort to induce large land owners along his line to plant trees that will in time furnish timber for fence posts for the plains country which the "Denver Road" traverses. This, of course, would not be the only advantage derived from the general planting of trees, but it is the material one presented as an inducement to undertake the work, most of the posts having to be bought elsewhere at the present time and hauled in by the railroad. Mr. Sterley has prepared a list of those who planted trees in the spring of 1903, which gives the kind and number of trees planted. This list shows a total of 110,000 black locust trees, 8,000 honey locust, 6,850 Russian mulberry, 17,075 osage orange, 2,350 catalpa and 3,550 ash.

Trolley Cars Stalled by Potato Bugs.

According to press reports, cars on the New Bedford, Middleboro & Brockton division of the Old Colony Street Railway are being stalled in Lakeville, Mass., by potato bugs. Since the cool weather set in the rails, warmed by the sun, attract the bugs in swarms at the middle of the day. The motormen have learned that the only way to keep their cars under control is to shut off power at the top of the grade where the potato fields begin, and to have the brake well in hand. The rails have been made so slippery that it is impossible for the cars to stop unless they are moving at very slow speed, and they can only be run up the grade with the greatest difficulty.

Swedish State Railroads and Single Phase Traction.

In connection with its forthcoming experiments with electric traction for railroad working, the Swedish Government is about to take advantage of the work which has been done by American and Continental electrical engineers during the last few years in perfecting single-phase alternating motors. It is announced that only the single-phase alternating current is to be tried. The trials are to be conducted under the supervision of the Royal Railway Board, and a sum of between £23,000 and £24,000 has been appropriated for the purpose. It is expected that early in 1905 a beginning will be made. A 14 km. section near Stockholm (the Tomtebodavartan & Stockholm-Jarfva line) is to serve for the experimental runs.

Tests of Rail Auto-Cars.

Ganz & Company recently delivered a 100 horse-power auto-car which was tested on the Hungarian State Railway. The car is 43 ft. long, and is the two axle type. Each axle is driven by a 50 horse-power motor of the geared wheel type. On one of the enclosed platforms are two boilers of 50 horse-power each, making two separate units of equal power, so that either 50 or 100 horse-power can be used. The wheel base of the car is 24 ft. 6 in. The total weight, including water and fuel for a 92 mile run, is 23 metric tons. The car has a seating capacity of 46 passengers besides a toilet and baggage compartment. The first speed trial against a strong head wind on a .67 per cent. grade gave 45 miles per hour. On a level road a speed of from 54 to 60 miles per hour was attained.

The New Shops of the Maine Central.

The Maine Central Railroad Company has just completed its new shops at Thompson's Point, Maine. The plant consists of a car repair shop and a locomotive repair shop, each 100 ft. x 240 ft. These are separated by a space of 150 ft., in which runs an electrically driven transfer table 70 ft. long, having a capacity of 150 tons. These shops are intended to handle general repairs to locomotives, and both light and heavy repairs for freight cars. Most of the machine tools are new and are driven in groups. A few of the tools have speed motors direct connected. The erecting floor is served by a 15-ton traveling crane. The current is supplied by two 75 k.w. units, each direct connected to a Westinghouse compound engine. The direct current system is used with a pressure of 220 v. for the power supply and 110 v. of three wire system for incandescent and arc lights. An air compressor of about 500 cu. ft. capacity made by the Chicago

Pneumatic Tool Company is installed in the power-house.

The St. Louis Trolley Wreck.

Six persons were killed and 19 injured, two probably fatally, in the wrecking of a suburban street car by a Wabash shuttle train at St. Louis, Sept. 3. The shuttle train was returning to the union station from the World's Fair grounds, and running at the rate of about 20 miles an hour. The street car was on its way to the suburbs with a load of passengers returning home. It stopped directly in front of the engine, and was cut in two. The engineman of the shuttle train, who blames the motorman of the electric car for the accident, said: "I was within 100 yards of the suburban crossing when I saw the suburban car start across the track. It looked to me as if it had ample time to get across."

The watchman and flagman at the crossing and some of the passengers confirm the statement that the car stopped, started across the railroad track and then stopped where it was struck. No satisfactory explanation has been given why the car stopped in the middle of the track.

Dry Dock at Brooklyn Navy Yard.

Bids opened Sept. 3 at the Navy Department for the new dry dock at the Brooklyn navy yard, for which an appropriation of \$1,000,000 has been made, were: George B. Spearin, New York, \$673,292; E. C. Moore, New York, \$946,000; John Pierce, New York, \$833,000; Keystone Construction Company, Syracuse, \$988,000; Jenks & Farrington, New York, \$996,400; F. W. Carlin Construction Company, New York, \$987,000; R. G. Packard Company, New York, \$973,000; New York Continental Jewell Filtration Company, \$899,400; United Engineering & Contracting Company, \$839,414. The new dry dock, known as Dry Dock No. 4, is to be built back of No. 1 and will extend back, diagonally, nearly to Morris avenue. It will be 550 ft. long, 120 ft. wide at the entrance, and about 160 ft. wide at the broadest part. The entrance sill will have a depth of 31 ft. of water at mean high water, and it can accommodate the largest warship of any country in service or now building.

Traffic Through the Soo Canals in August.

The following table shows the tonnage and the number of vessels which passed through the American and Canadian canals at Sault Ste. Marie, Mich., during the month of August.

Articles.	Canals.		Total.
	United States.	Canadian.	
Copper, net tons.....	13,738	1,076	14,814
Grain, bush.	1,264,030	202,000	1,466,030
Building stone, net tons.....	8,992	1,015	10,007
Flour, bbls.	314,085	256,111	570,196
Iron ore, net tons.....	3,369,268	363,173	3,732,441
Iron, pig, net tons.....	4,834	3,039	7,873
Lumber, M. ft., B.M.	148,120	2,188	150,308
Silver ore, net tons.....	245	149	394
Wheat, bush.	1,359,874	1,558,761	2,918,635
Gen'l mdse., net tons.....	8,389	3,447	11,836
Passengers, number.....	3,086	3,742	6,828
Westbound.			
Coal, hard, net tons.....	145,991	12,815	158,806
Coal, soft, net tons.....	957,156	189,799	1,146,955
Flour, bbls.	107	.....	107
Grain, bush. ....	.....	7,477	23,142
Mand iron, net tons.....	15,685	21,800	79,579
Salt, bbls.	57,779	21,371	84,034
Gen'l mdse., net tons.....	62,663	1,614	6,148
Passengers, number.....	4,634	.....	.....
Freight.			
Eastbound, net tons.....	3,763,905	456,135	4,220,040
Westbound, net tons.....	1,190,154	234,578	1,424,732
Total freight, tons.....	4,954,059	690,713	5,644,772
Vessel passages, No.	2,146	518	2,664
Reg'd tonnage, net.....	3,606,019	588,867	4,194,886

World's Fair Exhibit Car of F. M. Hicks & Company.

F. M. Hicks & Company, Chicago, are exhibiting at the World's Fair a handsome private car built at their own shops, some views of which are shown herewith. It contains an observation room, a state-room with upper and lower berth, a private room, bath-room, dining room, section for help, toilet room and kitchen. The car is 67 ft. long over end sills, 9 ft. 8 in. wide over side sills,

are English Wilton, and silk and velour hangings harmonize with the carpets and woodwork of the several rooms.

The state-room is finished in natural oak and contains upper and lower berths upholstered in mahogany frieze plush of small diamond pattern, with carpets, hangings and head-lining to match. The room contains a hopper with upholstered cover, folding white metal washstand and large locker, making a complete and comfortable compartment. It also connects with the bath. The bath-

million wood and green is very attractive. The dining room is 14 ft. long, finished in golden oak. The windows are extra wide, with art glass gothics, and in the piers are small carved alcoves with mirrors. The room contains a double sofa, the high back hinged to form an upper berth; dining chairs, upholstered in olive Spanish leather; 8 ft. extension dining table; sideboard; china cabinet, and writing desk, with bookcase above. The writing desk has an electric light inside with an automatic switch. The color



Private Car Exhibited at World's Fair, St. Louis, by F. M. Hicks & Company.

and 14 ft. 4½ in. high over all. It was built entirely at the Hicks shops except the trucks, which are Pullman six-wheel standard, with 38-in. steel-tired wheels. The rear end has a wide observation platform extending 3 ft. beyond the end sills, and recessed 2 ft. 6 in., with brass railings and gates, trap doors and extension steps. National steel platforms and couplers are used.

The observation room is finished in Cuban mahogany with four extra wide windows, art glass gothics, and low cut observation windows and door. The wood is beautifully

room has a porcelain bath tub, Aquameter hopper, white metal washstand with mirrors above, inlaid rubber tiling and rugs on the floor. The walls are wainscoted with tiling and finished above in quarter-sawed oak, wax finish. The window of the bathroom is art glass and cut high. The toilet room has a dresser, white metal washstand, cooler and Aquameter hopper, and the floors are covered with inlaid rubber tiling.

The private room measures 8 ft. 8 in. by 6 ft. 6 in., is finished in vermillion wood, and provided with a three-side brass bed, dull

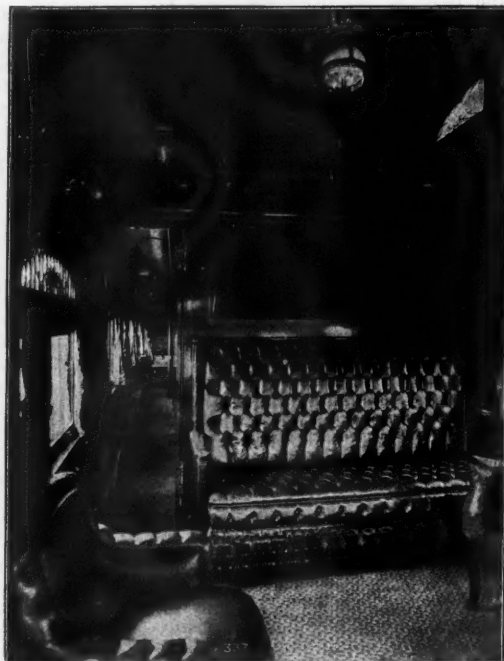
scheme is olive and gold, carpets, hangings, upholstery, table cover, head-lining, and art glass being in entire harmony.

The section for help is plain oak, upholstered in Chase leather, and has upper and lower berth. The kitchen is large and completely equipped. The refrigerator in the forward vestibule extends from platform to hood. It is furnished with bottle racks and shelves, and has a capacity for about 250 lbs. of ice. The storage cellars under the car have ample space for all requirements.

The car has a Baker heater and the Safety



Dining Room in Private Car.



Observation Room.

figured and matched, with a narrow inlaid border. The ceiling is Empire with head-linings done in a delicate shade of olive, illuminated in gold leaf. The deck ventilators and bulkhead transoms throughout the car are of ornamental glass. The observation room is upholstered in hand-buffed leather on chairs and double-sofa berth. The sofa has a high back, hinged to form an upper berth. The carpets throughout the car

Polet finish. The dresser is built in, with mirrors and small spindle racks above. There are also mirrors, spindle racks and lockers above the bed, and a comfortable wardrobe. Space under the stationary bed provides storage for two or three steamer trunks, and there are bedding drawers opening into the passageway. Carpets, hangings and upholstery are olive and the head-lining matches. The combination of the ver-

Car Heating & Lighting Company's direct steam system. It has Pintsch gas and electric lights, with reading lamps in the private room and state-room, and electric fans throughout the car. The shades are silk-faced Pantasote. The entire woodwork of the car, with the exception of the kitchen and section for help, is five-ply built-up veneer work, with neat inlaid borders, and highly polished.

Steam Turbine Condensing Outfits.

At the present time much interest centers in the steam turbine, which promises to reduce the weight and cost of prime movers. Two large machines of this type are on exhibition in block 51, aisle 1, and block 44, aisle 10, Machinery Building, at the St. Louis Fair, one being shown by the Westinghouse Machine Company and the other by the General Electric Company. Economic utilization of the energy of steam requires its expansion to the lowest possible pressure, which in the turbine is accomplished without the usual losses due to the corresponding extremely low temperatures. In actual service the economy of the turbine is increased by approximately 3 to 5 per cent. for each inch of vacuum higher than 26 inches. It is therefore of vital importance that all losses should be reduced to a minimum. The absence of oil from the steam renders the use of a surface condenser desirable in places where the saving of condensed steam is important. The fact that the final temperature of the condensing water must be comparatively low necessitates the highest degree of efficiency in its use and the immediate and complete removal of all non-condensable vapors, whose presence would increase the absolute pressure and consequently reduce the efficiency of the turbine.

The steam from the Westinghouse-Parsons turbines at block 51 is condensed in a 1,500 sq. ft. surface condenser, supplied by Henry R. Worthington. The air is removed by a Worthington rotative dry vacuum pump of the center crank type, but similar in other respects to the horizontal pumps already described. An air cooler is interposed between the condenser and the vacuum pump, considerably increasing the capacity and efficiency of the latter. The condensed steam is removed from the condenser by a Worthington volute pump directly connected to an induction motor. The operation of this pump is very interesting, since it requires neither valves nor floats and is not subject to vapor binding, as are reciprocating pumps. The pump is placed below the level of the condenser, receiving the water by gravity, and its capacity is such that it runs ahead of the supply, so that the suction pipe is never full. The discharge pipe is, however, always full and pressing back against the pump, but so long as the latter is in motion there is no possibility of the water passing back to the condenser, so no automatic devices are needed. In another turbine plant a pump of this character returns the hot water directly from the surface condenser to the boiler against a pressure of 250 lbs.

The Curtis steam turbine, exhibited by the General Electric Company in block 44, is the vertical type, and the condenser is placed in the base of the steam turbine. It contains 8,000 sq. ft. of tube surface and was built by Henry R. Worthington. The air is removed by a rotative dry vacuum pump, similar as regards the air end, to those heretofore described, but driven through the medium of a silent chain by an electric motor.

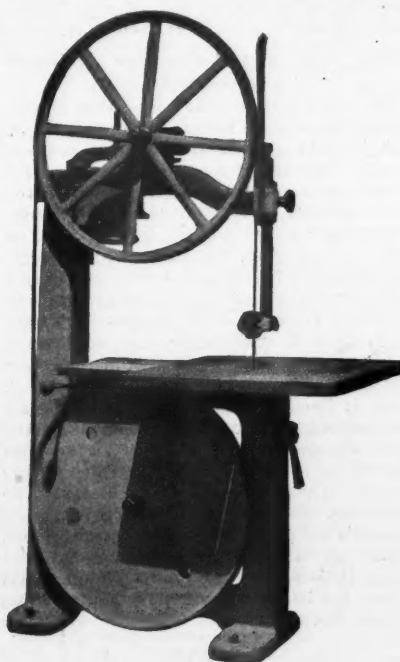
The Lake Shore Record Haul.

A brief note was printed last week describing the heavy train recently hauled over the Lake Shore between Youngstown and Ashtabula. Further particulars in confirmation of the press report have been received, as follows: The total length of the haul was 63 miles; actual tonnage of train, 5,974; running time, 4 hrs. 10 min. The train was hauled by engine No. 1,006, aided by a pusher out of the McGuffey street yard at Youngstown, and up a grade to Doughton. From

this point to Ashtabula, with the large engine under headway, the haul was made by it without further assistance. It was intended to test the locomotive with a load of 6,000 tons, but the cars of large capacity in the Youngstown yards did not hold out and it was not thought feasible to run a train of more than 100 cars. Engine No. 1,006 is of the 2-8-0 type and has 200,000 lbs. weight on the drivers and 35,000 lbs. on the pony truck; cylinder, 23 x 30 in.; weight of tender with coal and water, 78 tons. This is undoubtedly the heaviest train that has ever been hauled by a single locomotive. The actual distance that the train was handled by locomotive 1,006 after the pusher dropped off was 53 miles.

A New Scroll Saw.

The familiar jig scroll saw is rapidly being displaced by the band scroll saw, which combines all of the good points of the former with the added advantages of speed, efficiency and economy. One of the latest designs of this type of saw is shown in the illustration herewith. The upright column is



made very stiff and strong, enabling the machine to run at a high speed, without vibration. The iron table can be tilted and clamped to any angle. The new patent straining device on the saw is very sensitive, the top wheel hanging solely on a knife edge balance, thus maintaining at all times a perfect tension on the saw blade and adding materially to its life.

The lower wheel is solid, instead of having spokes, which prevents the circulation of sawdust, increases the momentum, and, being heavier than the upper wheel, controls its movement; there is thus no possibility of overrunning. The upper wheel can be raised or lowered while the machine is in motion, and all the different adjustments, stopping of feed, etc., are easily made. The claim is also made that it will do the work of two of the ordinary machines, especially where intricate scroll work is desired, in either light or heavy wood. It is made by J. A. Fay & Egan Company, Cincinnati, Ohio.

Railroad Accidents in Great Britain.

The railroad accident report of the Board of Trade for the three months ending March 31, 1904, shows that during that time 275 persons were killed and 1,665 persons were

injured on the railroads in the United Kingdom, an increase of 87 injured and decrease of eight killed over the corresponding period of 1903. Of these, 25 of the killed and 567 of the injured were passengers. Not a single passenger or employee was killed by accidents to trains or permanent way. Seven persons were killed and six injured at grade crossings. In addition to the above the railroad companies have reported to the Board of Trade the following accidents which occurred on the railroad companies' property, but in which the movement of vehicles used exclusively upon railroads was not concerned, namely: Four passengers, nine employees and two other persons killed; 217 passengers, 2,745 employees and 85 other persons injured; a total of 15 killed and 3,047 injured, as against 17 killed and 2,954 injured during the corresponding period in 1903.

Manufacturing and Business.

The Angels Iron Works, of Stockton, Cal., it is reported, will soon put up a new foundry and machine shop.

The Calumet Machine Company, of Chicago, is locating a site near Chicago for a foundry and machine shop.

The International Gas Engine Company, it is reported, is having plans made for building a machine shop at Laporte, Ind., to cost about \$150,000.

George M. Brush, 185 Summer street, Boston, Mass., has been appointed agent of the Railroad Supply Company, Chicago, for the New England States.

The Bryant Locomotive Spark Extinguisher Company, of Petersburg, has been incorporated in Virginia with a capital of \$500,000. August Wright is President.

The Bailey Iron Works Company, of Mobile, has been incorporated in Alabama with a capital of \$50,000 by A. Bailey, C. Bailey, S. L. La Vergy and W. G. Ward.

A. T. Kalas, formerly of the Railway Appliance Co., Chicago, will hereafter have charge of the railway supply department of Berger, Carter & Co., of San Francisco, Cal.

Broderick & Bascom Rope Company, St. Louis, has prepared a small folder giving a view and description of its World's Fair exhibit, and quotations of favorable comments made by different persons.

The Champion Seal Company, of New York, has been incorporated with a capital of \$1,000,000 to make machinery. The directors are: F. A. Huck, C. A. Wetsch and J. D. Fearbake, all of New York City.

The Kosmos Engineering Company, of Brooklyn, has been incorporated in New York with a capital of \$50,000. The directors are: Charles C. Branch, Samuel Kellock, A. Sanborn, D. Brower, Jr., and D. J. Stewart, all of Brooklyn.

The McConnell Wheel & Mine Supply Company, of Uniontown, Pa., recently incorporated with a capital of \$100,000, will make car wheels, gray iron and brass castings. C. H. Drum, L. F. Baker and others, of California, Pa., are interested.

The Friedrichstadt ship yards (of J. & A. Jensen ag Dahl, Kristiania), the largest in Norway, have adopted the "Haeseler" pneumatic hammers and drills as standard, and have given a two-year contract to the Ingersoll-Sergeant Drill Co.

The Universal Electric Equipment Company, of which John L. Parker, of Birmingham, Ala., is President, recently organized with a capital of \$60,000, will put up works

in Birmingham to make electrical train lighting, drilling and other appliances.

The Electric Steel Casting Company, of Matthews, Ind., has been incorporated with a capital of \$50,000 by G. S. Rivebolt, of that place; Philip Hughes, Johnstown, Pa.; Philip Angston and W. K. Gore, of Chicago.

The Rolfe Electric Company, of Rochester, has been incorporated in New York with a capital of \$150,000 to make electrical apparatus. The directors are: Frederick W. Zoller and J. G. Kalber, of Rochester; C. A. Rolfe, of Adrian, Mich., and others.

Bids are wanted September 17 by the Bureau of Yards and Docks, Navy Department, Washington, D. C., for three electric dock capstans with 15 h.p. motors for the Boston navy yard. Bids are also wanted on October 1 to build a concrete and stone dry dock at the Mare Island navy yard.

The Seamless Steel Tubes Co., of Detroit, Mich., has recently been reorganized and renamed, and will, in future, be known as the Detroit Seamless Steel Tubes Company. This company makes a specialty of cold drawn seamless steel locomotive flues and stationary boiler tubes. Plans are being prepared for a large addition to the plant.

The Lima Locomotive & Machine Company states that it has received more orders in August than in any previous month in its history. The erecting shop is working both a night and day force full time, and it is unable to keep up with the demand for Shay locomotives. The company also states that it is prepared to turn out direct connected locomotives suitable for plantation service, contractors, mines, quarries, switching service, and, in fact, all classes of service where the power required will not exceed 50 tons in weight.

A certificate reducing the capital of the National Car Wheel Company from \$9,000,000 to \$4,000,000 has been filed recently at Albany. Of the original capital, \$2,036,700 was actually issued. The debts and liabilities of the company are \$806,229. This company was incorporated in September, 1903, and acquired the following car wheel foundries: Keystone Car Wheel Co., Pittsburg; Cayuga Wheel & Foundry Co., Sayre, Pa.; Rochester Car Wheel Co., Rochester, N. Y., and Maher Wheel & Foundry Co., Cleveland, Ohio. The officers are: President, Charles T. Chapin; Vice-President, Chas. U. Slocum; Secretary, Charles A. Maher; Treasurer, W. T. Goodnow.

Iron and Steel.

The Pan-American Railway Co., it is reported, is in the market for 15,000 tons of 56 or 60-lb. rails.

The Commonwealth Steel Co.'s works at Granite City, Ill., have been bought by Clarence H. Howard and others, who will form a new company with a capital of \$1,000,000 to make cast-steel railroad specialties.

The Broomal Iron & Steel Co., of Belington, W. Va., has been incorporated with a capital of \$300,000 to make iron and steel by G. B. Broomal, T. C. Perrime and others, of Pittsburg, Pa., and S. M. Noan, of Weston, W. Va.

At the offices of the Federal Trust Co., in Newark, September 2, U. S. Senator James Smith, Jr., of the U. S. Circuit Court for the district of New Jersey, sold 300,000 shares of the stock of the Bethlehem Steel Co. at auction under a decree of the court which ordered the sale under foreclosure proceedings. There was only one bidder, Wm. C. Lane, President of the Standard Trust Co., New York, who bought the stock at the upset price of \$7,500,000.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies see advertising page 30.)

American Society of Civil Engineers.

At the regular meeting of this society September 7, the following papers were presented for discussion: "The Installation of a Pneumatic Pumping Plant," by Arthur H. Diamant, and "Some Notes on the Creeping of Rails," by Samuel Tobias Wagner. These papers were previously printed in the May proceedings, and the one dealing with rails is reprinted, in part, elsewhere in this issue.

National Railroad Master Blacksmiths' Association.

The officers of the National Railroad Master Blacksmiths' Association for the ensuing year are: President, T. F. Keane, Ramapo Iron Works, Hilburn, N. Y.; First Vice-President, D. B. Swinton, Canadian Pacific, Montreal; Second Vice-President, J. C. Sullivan, P. C., C. & St. L., Dennison, Ohio; Secretary and Treasurer, A. L. Woodworth, C. H. & D., Lima, Ohio; Chemist, G. H. Williams, B. M. Jones & Co., Boston, Mass. Cleveland was chosen as next meeting place.

Master Car and Locomotive Painters' Association.

The thirty-fifth annual convention of this Association will be held at Atlantic City, N. J., Sept. 13-16. Headquarters will be at Hotel Rudolf. The sessions of the convention are to be held in a large assembly room in the same building. The committee on arrangements has secured a \$3.00 per day rate, on the American plan, for rooms without bath. Papers on the following subjects will be presented at the convention: 1. Report of Committee on Tests. 2. What improvement have we made in the painting of steel cars in the past year? 3. What is the best material and treatment for locomotive front ends? 4. What is the best construction of sand blast and method of operating same, in preparing metal for painting? 5. Which is the best method for removing cracked varnish on the interior of passenger cars? 6. Essay. The treatment of an ideal passenger car from a painter's view. 7. Passenger car roofs. Treatment and attention of same. 8. Paint Shop, Records and Accounts, and 9. What causes the bulging of putty in the nail holes of new work?

PERSONAL.

—Mr. Charles S. Sutton, at one time Auditor of the Chicago, Santa Fe & California, died in Chicago on August 8.

—Mr. Alexander Pollock, a well known mechanical engineer, died at his home in Glen Ridge, N. J., on Sept. 3, at the age of 66. Mr. Pollock was a member of the American Society of Mechanical Engineers.

—Mr. George L. Barringer, formerly General Manager of the Cincinnati Northern, died at Waterport, N. Y., on Aug. 22, at the age of 78. Mr. Barringer was born in Troy, N. Y., and began his railroad work in 1851, and for the following 34 years served continuously in various positions in the construction department of railroads, and as freight and passenger conductor, Purchasing Agent, Secretary and Treasurer, General Freight Agent, Division Superintendent, General Superintendent and General Manager.

—Mr. Wilmot L. Estabrooke, for a number of years Superintendent and Purchasing Agent of the Monson railroad, died recently at his summer home at Lake Heron, Me. Mr. Estabrooke was born in Old Town, Me., and was 48 years old. He was educated in the public schools of his native town, and began his railroad service on the European

& North American in 1872. He then went to the Bangor & Piscataquis, where he remained but a short time. In 1883 he went to the Monson, with which company he has been connected for the past 21 years.

—Mr. D. L. Chesnut, Assistant to the President of the Western Steel Car & Foundry Company, Chicago, died at Plymouth, England, September 1. Several weeks ago he broke down with what threatened to be nervous prostration and on August 9 sailed for a short trip abroad for rest and recreation. He was taken ill on the boat and after landing at Plymouth developed pneumonia with other complications. Mr. Chesnut was born at Paris, Ill., in 1874, and was educated at the public schools there and at Northwestern University. He was formerly Assistant Treasurer of the Illinois Car & Equipment Company. His wife and three children survive him. He will be buried at Paris, his former home.

—Mr. Marshall E. Johns, whose promotion to the Superintendency of the New York, Susquehanna & Western and the Wilkesbarre & Eastern, to succeed Mr. Elston, is an-



nounced, is 44 years old. Mr. Johns entered railroad service at the age of 16, beginning as a brakeman on the Montclair & Greenwood Lake. This road had, up to about 1875, been operated by the New York & Oswego Midland. Mr. Johns worked as passenger and freight brakeman, freight and passenger conductor and yardmaster. When, in 1894, the Wilkesbarre & Eastern Division was built from Stroudsburg to Wilkesbarre, he was appointed Trainmaster, from which position he is now promoted to be Superintendent of the New York, Susquehanna & Western at Jersey City.

—Mr. Thomas H. Malone, formerly, and for a number of years, General Freight Agent of the Wisconsin Central, died recently at his home in Milwaukee, Wis. Mr. Malone was born in Sterlingville, N. Y., in 1842, and began his railroad work as a freight clerk at Detroit for the Michigan Central in 1866. The next year he became a clerk in the general office. Then for about six years he was in the freight office of the Michigan Southern & Northern Indiana. From this road he went to the Canada Southern, and in 1874, was appointed General Freight Agent of the Logansport, Crawfordsville & Southwestern. For two years from 1875, he held a similar position on the Sheboygan & Fond du Lac, but in 1877 he resigned from this company, and with the added title of Passenger Agent, returned to the Logansport, Crawfordsville & Southwestern. In January, 1879, he left this latter road to go to the Wisconsin Central as General Freight Agent. At the time of his death Mr. Malone

was out of railroading, being in the real estate business.

ELECTIONS AND APPOINTMENTS.

Chicago & Erie.—See Erie.

Chicago & North Western.—W. E. Morse has been appointed Superintendent of the Northern Wisconsin Division, with headquarters at Fond du Lac, Wis., succeeding H. W. Battin, resigned.

Chicago, Burlington & Quincy.—The Burlington Divisions west of the Missouri River, are to be operated in two districts, with G. W. Rhodes, Assistant General Superintendent, in charge of the Western District, and H. E. Byram, the new General Superintendent, in charge of the Eastern District.

Coahuila & Pacific.—E. R. Walter has been appointed General Superintendent, with headquarters at Saltillo, Mex., succeeding L. T. Westrich, resigned.

Coal Belt.—J. S. Macpherson has been appointed Auditor.

Denver & Rio Grande.—J. L. Thompson has been appointed Superintendent of Bridges and Buildings, with headquarters at Pueblo, Colo., succeeding F. B. Clark, resigned.

Detroit & Charlevoix.—On the first of this month the general offices of this company were removed from Deward to South Arm, Mich.

Erie.—J. S. Barrow has been appointed Assistant General Passenger Agent of this company and the Chicago & Erie, with headquarters at New York City.

Flint River & Northeastern.—H. H. Steele has been appointed Traffic Manager and Auditor, with office at Pelham, Ga. D. M. Rogers, General Superintendent, has resigned and the duties of that office will be assumed by the General Manager.

Illinois Central.—J. N. Borrowdale has been appointed General Foreman of the Car Department, with headquarters at Chicago, Ill., succeeding C. D. Pettis, resigned. (See St. Louis & San Francisco.)

Indiana Harbor.—Honore Palmer has been elected Vice-President, with office at Chicago, Ill.

Mexican Roads.—John Phillips, hitherto Superintendent of Permanent Way of the Mexican Railway, has been appointed Chief Engineer of Location and Construction of a new line that is to be built from Sayula Station to the mining camp of Zimapan. Work is to be begun about the middle of this month. Richard Honey is to be president of the new company.

Mexican Southern.—J. A. Chisholm has been appointed Resident Engineer, with headquarters at Pueblo, Mex., succeeding T. A. Corry, resigned.

Midland Terminal.—G. W. Shannon, Auditor, has been appointed Secretary also. J. J. Cogan has been appointed Treasurer, with office at Cripple Creek, Colo.

Missouri Pacific.—A. H. Moll has been appointed Superintendent of the Colorado Division, with headquarters at Pueblo, Colo., succeeding R. H. Dwyer.

Mobile, Jackson & Kansas City.—B. M. Robinson has been elected President, succeeding W. D. Stratton, who has been elected Chairman of the Executive Committee.

New York & Pennsylvania.—Theodore Cobb has been appointed General Manager, with headquarters at Canisteo, N. Y.

New York, Susquehanna & Western.—Marshall E. Johns, hitherto Trainmaster, has been appointed Superintendent, with headquarters at Jersey City, N. J., of this company and the Wilkesbarre & Eastern, succeeding A. C. Elston.

National of Mexico.—James Farrell has been appointed Acting Superintendent of

Motive Power and Machinery, with headquarters at Laredo, Tex.

Norfolk & Western.—L. P. Ligon has been appointed Master Mechanic of the Eastern General Division, with headquarters at Roanoke, Va., succeeding H. T. Herr, resigned. L. D. Gillett has been appointed Master Mechanic of the Pocahontas Division, with headquarters at Bluefield, W. Va., succeeding Mr. Ligon, and Mr. Gillett in turn is succeeded by J. M. Thomas as General Foreman at West Roanoke, Va.

Northern Pacific.—B. L. Crosby has been appointed Principal Assistant Engineer, with headquarters at Tacoma, Wash., and will have charge of the construction department matters on the Western Divisions.

Pere Marquette.—M. J. Carpenter, Vice-President and General Manager, has resigned. It is understood that Mr. Carpenter will engage in the coal business in Chicago.

St. Louis & San Francisco.—C. D. Pettis, hitherto General Foreman of the Car Department of the Illinois Central at Chicago, has been appointed Superintendent of the Car Department of the St. L. & S. F., with headquarters at St. Louis, Mo.

St. Louis, Iron Mountain & Southern.—E. Jones has been appointed Master Mechanic with headquarters at Argenta (Baring Cross), Ark.

San Pete Valley.—H. S. Kerr having resigned as General Superintendent and General Freight and Passenger Agent, U. U. Hiskey has been appointed Traffic Manager, in addition to his duties as Secretary and Treasurer, with headquarters at Salt Lake City, Utah. W. A. Tyler has been appointed Auditor to succeed Mr. Hiskey, and J. H. Hornung has been appointed General Agent at Manti, Utah. Effective Sept. 1.

Santa Fe Central.—W. D. Lee, General Manager, and B. W. Robbins, General Freight and Passenger Agent, having resigned, S. B. Grimshaw has been appointed Assistant to the President and General Manager (W. H. Andrews), as well as General Freight and Passenger Agent, with headquarters at Santa Fe, N. Mex.

Seaboard Air Line.—J. G. Cantrell has been appointed Assistant General Freight Agent with headquarters at Birmingham, Ala.

Southern.—C. B. Cramer, hitherto Master Mechanic of the Charleston shops, has been transferred to the Sheffield shops at Sheffield, Ala., succeeding G. N. Howson. W. L. Pierce, hitherto Trainmaster, has been appointed Superintendent of the Jacksonville Division, with headquarters at Jacksonville, Fla., succeeding W. L. Williamson, resigned.

Tennessee Central.—L. F. Lonnbladh has been appointed Acting Engineer of Construction, with headquarters at Nashville, Tenn.

John A. Pitts has been elected Second Vice-President, with office at Nashville, Tenn.

Wabash-Pittsburg Terminal.—A. H. Calef (Secretary and Treasurer of the Missouri Pacific) has been appointed Vice-President and J. C. Otteson (Secretary and Assistant Treasurer of the Wabash) has been appointed Assistant Secretary of the W. P. T. F. H. Tristram has been appointed Assistant General Passenger Agent, with headquarters at Pittsburg, Pa.

Wilkesbarre & Eastern.—See New York, Susquehanna & Western.

LOCOMOTIVE BUILDING.

The Northern Pacific has ordered 25 locomotives from the Brooks works of the American Locomotive Co.

The Chicago, Burlington & Quincy denies that it has ordered eight locomotives from

the Baldwin Locomotive Works, as reported in our issue of September 2.

CAR BUILDING.

The Chesapeake & Ohio is reported to be in the market for six steel hopper cars.

The St. Louis, Troy & Eastern is reported to be in the market for 300 gondola cars.

The Chicago, Peoria & St. Louis has ordered 400 coal cars from the Mount Vernon Car Co.

The Mississippi River & Bonne Terre is having 20 freight cars built at the Detroit works of the American Car & Foundry Co.

The Butte County Railroad is having 40 freight cars built at the Hegewisch, Ill., works of the Western Steel Car & Foundry Co.

The Cincinnati, Hamilton & Dayton is in the market for 17 passenger coaches, and this number may be largely increased at a later date.

The Erie is having 10 express cars built at the St. Charles, Mo., works of the American Car & Foundry Co., as reported in our issue of July 22.

The Lawson Car Co. has ordered 15 Lawson steel dump cars from the Cambria Steel Co. In our issue of May 6 it was reported to be in the market for 100 cars.

The Argentine Government has ordered 640 freight cars from the Middletown Car Works, Middletown, Pa. The date of delivery of these cars will begin October 1.

The Chicago & Western Indiana, which was reported in our issue of August 26 as being in the market for 28 suburban cars and two combination cars, has placed the order for these cars with the American Car & Foundry Co.

The Argentine Government has ordered 16 passenger, 8 sleeping and 14 baggage cars from the Wason Mfg. Co., Springfield, Mass. These cars will be 50 ft. long and will be built for meter gage. The bodies only will be furnished by the builders and the wheels, axles and trucks will be shipped direct to Argentine from Germany. The contract calls for delivery within six months.

The Atlantic Coast Line, as reported in our issue of August 26, has ordered 500 ventilated fruit cars of 60,000 lbs. capacity from the South Baltimore Steel Car & Foundry Co. These cars will weigh about 31,000 lbs., and measure 36 ft. long, 8 ft. 6 in. wide, and 7 ft. 6 in. high, all inside measurements. The special equipment includes: Atlantic Coast Line Standard brake-beams, Westinghouse air-brakes, Damascus Bronze Co.'s brasses, Tower couplers, Atlantic Coast Line standard doors, Thornburg draft rigging, Harrison dust guards, National Malleable Castings Co.'s journal boxes and lids, Atlantic Coast Line standard roofs, and South Baltimore Steel Car & Foundry Co.'s wheels.

The Central Railroad of New Jersey, as reported in our issue of September 2, is building three open-end baggage cars and two open-end combination cars at its Elizabethport shops. The baggage cars are 60 ft. long over end sills, 9 ft. 8 in. wide over side sills, and 13 ft. 10 in. high from top of rail. They have wooden under frames and weigh 73,500 lbs. The combination cars have the same dimensions and weight. Special equipment for both includes: American Steel Foundries cast-steel double-body bolsters, Diamond Special brake-beams, Diamond S brake-shoes, Westinghouse high-speed air-brakes, Buhoop 3-stem buffers and couplers, Gold steam heating system, Pintsch gas, Standard steel platforms, Taylor steel-tired fused wheels and C. R. R. of N. J. standard brasses, journal boxes, and 4-wheel trucks.

The Gulf & Ship Island, as reported in our issue of August 26, has ordered 250 box cars of 60,000 lbs. capacity from the American Car & Foundry Co., for October delivery. These cars will be 39 ft. 4 in. long, 8 ft. 4 in. wide, and 8 ft. 2 in. high. The

special equipment includes: Commonwealth Steel Co.'s bolsters, Simplex metal brake-beams, Lappin brake-shoes, Westinghouse air-brakes, Ajax plastic bronze brasses, Tower couplers for 200 cars and Worthington couplers for 50 cars, National automatic door fastenings, Security doors, Miner draft rigging for 200 cars and Republic draft rigging for 50 cars, Franklin Manufacturing Co.'s dust guards, McCord and National Malleable Castings Co.'s journal boxes and lids, Gulf & Ship Island standard paint, Murphy's and Republic roofs, Railway Steel Spring Co.'s springs, and Decatur Car Wheel Manufacturing Co.'s cast-iron wheels.

BRIDGE BUILDING.

BATTLE CREEK, MICH.—The Common Council has been petitioned by residents to build a bridge over the Kalamazoo River on Barney street.

BEAUMONT, TEX.—The Texas & New Orleans and the city will jointly build a steel bridge over the railroad tracks, probably at Archer street, to cost about \$30,000.

FARGO, N. DAK.—Bids are wanted Sept. 26 by A. G. Lewis, County Auditor, for building two bridges in Cass County.

FORT WILLIAM, ONT.—The City Council is having plans made for a steel bridge over the river.

FRANKLIN, PA.—Viewers appointed to select a site for bridges recommend a county bridge over Silver Creek; also over Mill Creek.

GREEN BAY, WIS.—The Commissioner of Streets and Bridges will ask bids for building a bridge over East River at Webster avenue, to cost about \$12,000.

HARRISBURG, PA.—Separate bids are wanted Sept. 20 by J. M. Shumaker, Superintendent of Public Grounds and Buildings, for rebuilding the substructures and superstructures of the following bridges: At Conewago Creek, in York County; the highway bridge over Penn's Creek, in Snyder County, and the highway bridge over Mahoning Creek, in Armstrong County.

The Board of Public Grounds and Buildings opened about 27 bids Aug. 30 for the bridges at Safe Harbor, in Lancaster County, and Redbank, in Jefferson County. The contracts were awarded to the Eyre Construction Co., of Philadelphia, for the bridge at Safe Harbor at their bid of \$69,987, and to the Penn Bridge Co., of Beaver, Pa., at \$59,983 for the bridge at Redbank. The Pennsylvania Steel Co. bid \$75,000 for the Safe Harbor bridge and \$65,000 for the Redbank bridge; John A. Westbrook, of Harrisburg, bid \$73,000 for the Safe Harbor bridge and \$63,149 for the Redbank bridge.

HUNTINGDON, PA.—Blair and Huntingdon Counties will jointly build a bridge over the Juniata River in Tyrone Township.

INDIANAPOLIS, IND.—Bids are wanted Sept. 27 by the Board of County Commissioners for building a bridge 531 ft. long of five spans over the White River at Morris street. John E. McGaughey is a commissioner.

JAMESTOWN, N. Y.—An arrangement has been made by the Chautauqua Traction Co. and the Pennsylvania to jointly build an overhead crossing at Valley street, in Mayville, at a cost of about \$25,000.

JUNCTION CITY, KAN.—Bids are wanted Sept. 17 by W. B. Spurlock, County Clerk, for building a steel bridge 130 ft. long in Geary County.

NORRISTOWN, PA.—Bids are wanted Sept. 19 by Montgomery County Commissioners for building a bridge over Perkiomen Creek in Upper Hanover Township. Benjamin F. Penrose is a commissioner.

OAKLAND, MD.—Bids are wanted Sept. 13 by A. G. Ross, Clerk of the County Commissioners, for an iron bridge over the Youghiogheny River.

PEORIA, ILL.—Bids, it is reported, are being asked Sept. 13 by J. Newsan, Chair-

man Special Bridge Committee, for building the steel bridge and approaches over the Illinois River at Bridge street.

PHILADELPHIA, PA.—The Board of Surveyors is considering the question of building bridges over the Chestnut Hill branch of the Reading Ry.; also over the Reading's Port-Richmond branch.

TEMPLE, TEX.—The City Council is considering the question of issuing \$3,000 in viaduct bonds for a viaduct to be built over the Santa Fe tracks on South First street. The entire cost of the work will be about \$24,000.

TERRE HAUTE, IND.—The Southern Indiana Railway Co., it is reported, has engineers taking soundings to locate a site for two bridges to be built over the Wabash River.

WILLIAMSPORT, MD.—Plans are being made by P. J. Courtenay, of Philadelphia, for a bridge over the Potomac river to cost about \$75,000.

WILKESBARRE, PA.—Bids are wanted Sept. 12 by W. B. Allegar for building a steel bridge over Spring Brook.

WINCHESTER, ONT.—Dunn & Fullerton, engineers, are preparing plans for a steel bridge to be built over the Nation River.

WINNIPEG, MAN.—The cities of Winnipeg and St. Boniface will jointly build a new steel traffic bridge over the Red River between Pacific and Banatyne avenues.

Other Structures.

ALEXANDRIA, VA.—The Washington Southern, it is reported, has plans ready for building a new passenger station.

DU BOIS, PA.—The Buffalo, Rochester & Pittsburg, it is said, will put up a new boiler shop 140 ft. x 300 ft.

CHARLESTON, W. VA.—The Chesapeake & Ohio has given a contract to J. E. and A. L. Pennock, of Philadelphia, Pa., at about \$58,000, for building its brick passenger station, to consist of two stories 39 ft. x 95 ft.

CHICAGO, ILL.—The Illinois Tunnel Company has leased ground for 99 years for a site for its large power house.

EL PASO, TEX.—The El Paso & Southwestern is planning to build big car shops either at this place or at Douglass.

KENSINGTON, ILL.—The Michigan Central is making plans to put up a grain elevator with a power plant having about 400 h.p.

KENSINGTON, PA.—The Pennsylvania, it is reported, will build a brick freight station here.

MENOMINEE, MICH.—Plans, it is reported, are being made by the Chicago & North Western for a new passenger station here.

NEWPORT, ARK.—The Missouri Pacific, it is reported, will build a new freight house with a covered platform about 1,000 ft. long and make other improvements at a cost of about \$20,000.

OSWEGO, N. Y.—The Delaware, Lackawanna & Western, it is reported, is making plans for a new passenger station here.

The New York, Ontario & Western has plans ready for building a brick freight house 30 ft. x 100 ft. in East Schuyler, to cost about \$15,000.

PINE BLUFF, ARK.—An officer of the St. Louis Southwestern tells us that plans have not yet been made, but that the company will build a steel and brick freight house on Third avenue, the work to be done by the company's forces.

SOMERSET, KY.—The Cincinnati Southern has taken title to about 200 acres of ground, and it is said the company's shops will be removed from Ludlow, Ky., and Chattanooga, Tenn., to this place.

SPOKANE, WASH.—Plans are being made by the Oregon River & Navigation Co. for building a new passenger station to replace the one destroyed by fire two years ago.

TYLER, TEX.—The St. Louis Southwestern has submitted plans to the railroad commis-

sioners for a brick passenger station to cost about \$15,000.

WESTCHESTER, PA.—The Philadelphia & Westchester Traction Co. has bought land as a site for a new power house to cost about \$150,000, including the necessary machinery.

WHEELING, W. VA.—A committee has been appointed to select a site for a new union passenger station.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALASKA CENTRAL.—An officer is quoted as saying that 10 miles of this road have been completed and that 18 miles more have been graded from Seward in a northerly direction. The proposed route is from Seward, on Resurrection Bay, Alaska, north to Lake Kenai, and thence through Cariboo and Tanana passes to Rampart City, 500 miles. The Tanana Construction Company is doing the work. G. W. Dickinson, Seattle, Wash., is President. (April 1, p. 263.)

ALBION & LOCKPORT.—This company has been incorporated in New York with a capital of \$260,000 to operate a road between Albion and Lockport, a distance of 25 miles. The directors are: A. K. Potter, Lockport, N. Y., and George B. Church, of Albion, N. Y.

ALBION & ROCHESTER.—This company has filed a certificate of incorporation in New York with a capital of \$300,000 to operate a street surface road from Albion, in Orleans County, to Rochester, a distance of 28 miles. The incorporators are: A. K. Potter, Lockport, N. Y., and Lorenzo Burrows and George B. Church, Albion, N. Y.

BINGHAMTON & SOUTHERN.—It is reported that work will soon be begun on the extension from Binghamton, N. Y., to Williamsport, Pa., 116 miles. (April 1, p. 264.)

BUFFALO & SUSQUEHANNA.—The southern extension of this road has been completed to Du Bois, Pa., 55 miles south of Sinnemahoning, affording at this point, and also at Medix Run and Tyler, Pa., access to the coal mines owned by the company. Surveys for a further extension at a point about 55 miles southwest of Du Bois, and about the same distance north of Pittsburg, are being made. This extension will also open extensive coal fields, in which the company's holdings are estimated, for both branches, at about 120,000,000 tons.

CALGARY & EDMONTON.—This company has filed maps with the Canadian Government showing the extension of its branch line from Wetaskiwan in an easterly direction to Battleford. Work on this extension is now in progress. (See Construction Supplement.)

CANADIAN NORTHERN.—This company has filed plans of the proposed line from Hartney, Man., to Regina, N. W. T., with the registrar of the Assiniboia registration district. The projected route is almost an air line, 198 miles long.

CEDAR FALLS & NORTHEASTERN.—Articles of incorporation have been filed by this company in Iowa with an authorized capital of \$25,000. The line will be about two miles long and will connect the Dubuque & Sioux City at a point near Cedar Falls with the Cedar Falls & Minnesota, at a point near Janesville. Stuyvesant Fish is President, J. C. Welling, First Vice-President, and J. T. Harahan, Second Vice-President.

CENTRAL VERMONT.—It is said that a branch will be built from Bethel, Vt., to the newly developed granite quarries, three miles. The cost will be about \$200,000 and the branch is to be completed this fall.

CHICAGO, ROCK ISLAND & PACIFIC.—Contract has been let to W. A. Shippy for building the extension west from Ardmore, Ind. T., to Waurika, on the main line. Grading will be commenced at once. This branch will open up one of the richest sections in the Chickasaw nation and will give Ardmore a straight line to Lawton.

CONWAY, COAST & WESTERN.—According to

press reports, this company has received an extension of the charter granted to the Conway-Seashore railroad with the privilege of building from Sumter, S. C., east through Conway to Southport, N. C., 125 miles. A branch line will also be built from a point near Cool Springs, S. C., northeast to Marion, 60 miles. Connection will be made with the Atlantic Coast Line and the Southern at Sumter, and with the Atlantic Coast Line and Carolina Northern at Marion. F. A. Borroughs, Conway, S. C., is Vice-President.

DELAWARE & HUDSON.—A contract has been let to Higley & Barber, of Sandy Hill, N. Y., for grading the proposed extension on the Adirondack division from Thurman, N. Y., to Warrensburg, five miles. (See Construction Supplement.)

DELTA SOUTHERN.—An officer writes that a charter has been granted this company to build a railroad from Kuhns, in Bolivar County, Miss., southeast to Campbellsville, in Yazoo County, about 60 miles. The Percy branch of the Southern, from Leland to Percy, in Washington County, will be used as part of the line. Bids are now being asked for building the line from Elizabeth in a northerly direction for a distance of 10 miles. The contract calls for the completion of this work within 90 days after it is let. W. W. Stone, Greenville, Miss., may be addressed. (August 26, p. 73.)

DUBLIN & SOUTHWESTERN.—Surveys have been completed and grading is now in progress on this road from Rentzville, Ga., to Eastman, 17 miles. E. P. Rentz, Dublin, Ga., is President and Chief Engineer. (August 12, p. 57.)

DYERSVILLE & NORTHERN.—This company has been incorporated in Iowa with a capital stock of \$75,000 to build a railroad from Dyersville to New Vienna, five miles, and, at a later period, extensions to various points. The incorporators are: Jacob Herper, G. H. Hessleman, E. C. Peaslee and others, of Dubuque, Iowa.

EUREKA & PALISADE.—The newspapers say that surveys are now being made for the extension of this line from Eureka, Nev., southeast to Ely, 60 miles. G. D. Abbott, Palisade, Nev., is Superintendent.

FORT ADAMS, WOODVILLE & CENTERVILLE (Electric).—Application has been made by this company for a charter to build an electric railroad in Mississippi connecting the three towns named in the title. The total length will be about 34 miles. C. M. Stricker, Fort Adams, Miss.; W. L. Ferguson, Woodville, Miss., and others are incorporators.

KALAMAZOO & CHICAGO.—Maps have been filed by this company showing a change in the location of its proposed belt line in Kalamazoo, Mich. M. H. Lane is President.

LANSING MANUFACTURERS' RAILROAD.—Incorporation has been granted this company in the State of Michigan with an authorized capital of \$100,000. It is proposed to build a belt line around the city of Lansing, connecting all the railroad lines entering the city with the various manufacturing industries. The length of the line is about 10 miles. S. L. Smith, Detroit; J. H. Seagar, Lansing, Mich., and others are directors.

LINALES AL GOLFO.—Work has been begun on this road, which is being built in the interest of the San Carlos Copper Co. from Linales, in the State of Nuevo Leon, Mex., to San Jose, 37 miles. The mines of the copper company are situated at San Jose. The work is being done partly by the company's own forces and partly by outside contractors. The line will be standard gage throughout and will be laid with 45-lb. rails, which are already on the ground. The work is somewhat heavy, with several fills ranging as high as 60 ft. It is the intention of the company to eventually extend the line to the Gulf coast, a distance of 130 miles. Connection will be made with the Mexican Central at Linales and the ore from the copper mines will be shipped from this point to the coast. E. D. Self, Linales, Mex., is General Manager of both the San Carlos Copper Co. and of the railroad.

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—The Winnipeg branch has been extended from Ottotail, Minn., north to Detroit, Minn., 34 miles, and is now open for traffic between these two points.

MUNISING RAILROAD.—Maps have been filed by this company showing the proposed extension of its east branch in Alger County, about eight miles in length. H. R. Harris, Marquette, Mich., is General Manager. (See Construction Supplement.)

NATCHEZ, COLUMBIA & MOBILE.—According to press reports, this company has begun work on an extension from Roonville, Miss., to the Pearl River, 7½ miles. R. B. Butterfield, Norfield, Miss., is General Manager.

NEW HOPE VALLEY.—A contract has been let by this company to Ferrel & Noe, of Pittsboro, N. C., for building the first three miles of its road out of New Hill, N. C. The contract calls for the completion of the work by November 1. Contracts for the remainder of the line will soon be let. William Moncure, Raleigh, N. C., is President. (July 1, p. 23.)

NEW MEXICO MIDLAND.—Work has been suspended on the construction of this road pending the decision by the U. S. Land Office of the legality of the company's title to the abandoned right of way of the Santa Fe.

OREGON RAILROAD & NAVIGATION COMPANY.—This company has given a contract to the Pacific Coast Construction Co., of Portland, to build the Condon-Arlington branch line, to run through a wheat country in Gilliam County, a distance of 50 miles. Work will be begun at once, and includes a number of bridges, culverts, cuts and fills. The contract calls for its completion during the year.

PORTO RICO ROADS (Electric).—The Porto Rico Light & Power Co., assignee of the franchise granted to the Vendergrift Construction Co., of Philadelphia, has begun work on an electric railroad between San Juan, Porto Rico, and Ponce, 70 miles. The line will pass through Rio Piedras, Caguas and Trujillo Alto, and the plans and profiles have been approved by the Bureau of Public Works. It is stated that contracts for rails and equipment will shortly be let. (See Construction Supplement.)

QUEBEC WESTERN & ATLANTIC.—This company, organized some time ago in England, has obtained a Dominion charter, and a subsidy of \$6,400 a mile from the Government, together with a grant of 4,000 acres per mile from the legislature of the Province of Quebec. The land is to be sold to settlers at a maximum rate of \$2 an acre. The projected road will run from a point at or near Gaspe Village, through a mountainous district about 175 miles long, to Causapcal, where it will connect with the Intercolonial Railway. The road is projected to connect with a line of steamers to Great Britain, avoiding the dangers of the St. Lawrence River and gaining 24 hours in time over the present route from Montreal. The same company is planning to build the remaining portion of the line along the Gaspe coast to connect with the Atlantic & Lake Superior Railway, now operating between Matapedia and Paspébiac, in the county of Bonaventure. The latter will be a very expensive road to build; it will cross five or six rivers at their mouths, where costly bridges will have to be built. The charter provides for the building of both sections at the same time under penalty of forfeiture of the charter. Beyond making surveys no work has as yet been done. A meeting of the stockholders will soon be held in Gaspe to give out contracts and commence operations.

ST. LOUIS, BROWNSVILLE & MEXICO.—A contract has been let to Johnston Bros. for building an extension from Robstown, Tex., to Bay City, 154 miles. Surveys have been completed and rights of way secured, and grading will be begun at once. Sub-contracts for grading have been let to Johnston & Read; for track laying, bridges and building, to the McCabe & Steen Construction Co., and for masonry work, to the Hedge-Gosney

Construction Co., all with headquarters at Corpus Christi, Tex. F. G. Jonah is Chief Engineer. (August 26, p. 74.)

ST. LOUIS, IRON MOUNTAIN & SOUTHERN.—It is announced that on August 15 the Memphis, Helena & Louisiana line from McGehee, Ark., to Bonham, 22 miles, was opened for business.

SAN ANTONIO & GULF.—This company, it is reported, will build an extension from Stockdale, Tex., northeast through the towns of Leesville, Gonzales, Woelder and others, a distance of about 100 miles, to Somerville, at which point it will make connection with the Gulf, Colorado & Santa Fe. E. E. Shackford, San Antonio, Tex., is General Manager.

SCOTT VALLEY.—This company, which has been organized to build a road from Yreka, Cal., to Etna, a distance of 42 miles, it is said, has given a contract to the E. B. & A. L. Stone Co., of San Francisco, and the New York Construction & Development Co., of Yreka, for the building and grading of the roadbed, on which work is to be commenced within 30 days. Joseph Johnston, of San Francisco, is interested in the company.

SOMERSET RAILROAD.—This company is now building the first section of its road from Bingham, Me., to the Deadwater of Austin, a distance of nine miles, and will next year continue the road to its destination at Birch Point on the shore of Moosehead Lake, opposite Kineo. The grade is heavy, and at the Deadwater of Austin the road will cross the Gulf stream over the highest trestle in the State, which is to be a steel viaduct 600 ft. long and 112 ft. above water. The contract for grading of the roadbed has been let to Mitchell & Johnson, of Oakland, Me., and the company's men will do the track laying. John F. Hill, of Augusta, and William T. Haines, of Waterville, are the principal promoters.

SOUTH SHORE TRACTION COMPANY.—This company has made application to the New York State Railroad Commission to build a trolley line 60 miles long through Suffolk and Nassau Counties, Long Island, beginning at Central avenue, in Jamaica, passing through Hempstead, Oyster Bay and Patchogue, and terminating in Brookhaven. The company has an authorized capital of \$2,000,000, of which \$150,000 has been paid up. J. A. Hawes is Vice-President.

SUPERIOR & SOUTHEASTERN.—This company, it is announced, has plans ready for an extension of its road 45 miles in a southeasterly direction into Northern Wisconsin, which is at present without railroad facilities. J. E. Glover, L. A. Baker and others, of New Richmond, Wis., are incorporators.

VALLEJO, NAPA & BENICIA (Electric).—Grading is reported practically completed on this electric railroad from Vallejo, Cal., north to Napa, 15 miles. Large quantities of rails and ties have just been received by the company and track laying is to be begun at once. The line will eventually be extended to Benicia. J. W. Hartgell, Oakland, Cal., may be addressed.

RAILROAD CORPORATION NEWS.

ATLANTIC & NORTH CAROLINA.—This company, which operates a line from Goldsboro to Morehead City, N. C., and is owned in part by the State for a term of 91 years, is reported leased to the Howland Improvement Co. By the terms of the agreement the latter company will spend about \$250,000 in improvements during the next three years. R. S. Howland, of Providence, R. I., is president.

CANADA ATLANTIC.—Apparently reliable press reports state that this road, which is operated from Depot Harbor, on Georgian Bay, to Coteau, Quebec, and Swanton, Vt., has been sold to the Grand Trunk for \$12,000,000, and a meeting of the shareholders will be held in London September 29, to ratify the terms of the agreement.

CANADIAN PACIFIC.—The statement for July shows gross earnings for the month of \$4.

398,833, and working expense \$2,949,181, as compared with gross earnings of \$3,997,343, and working expenses \$2,678,816 in July, 1903. The net earnings are \$1,449,652 for July, 1904, as against \$1,318,527 for July, 1903.

CHICAGO GREAT WESTERN.—This company is offering through Eversz & Co., of Chicago, five-year, 5 per cent. gold notes dated Aug. 1, 1904; due Aug. 1, 1909; interest payable February and August; principal and interest payable in New York in gold; redeemable at the option of the company on any interest date upon 30 days' notice at 101 and interest. The amount authorized to be issued is \$2,500,000, of which \$1,500,000 are to take up existing notes and \$1,000,000 are for improvements and betterments. These notes are a direct obligation of the company prior to the debenture stock.

CHICAGO TERMINAL TRANSFER RAILWAY.—A committee of holders of preferred and common stock of this company has asked owners of these stocks to transfer their holdings to the secretary of the committee in order that it may take action to protect the interest of holders of the company's securities. The Terminal Transfer Co. failed to earn fixed charges during the last fiscal year owing to the fact that the Lake Shore, Rock Island and the Nickel Plate terminated their contracts for terminal facilities, which caused a decrease in the gross receipts from rentals of \$166,000. The company has excellent transfer facilities in Chicago, but has, so far, been unable to find the desired traffic.

CINCINNATI, HAMILTON & DAYTON.—An agreement has been made by which this company and the Pere Marquette will in future use the tracks of the Wabash between Romulus, Mich., and Detroit, 15 miles. This will make a route from Detroit to Toledo, 66 miles long, which is 6 miles longer than by the Michigan Central, which was the former Detroit connection of the C., H. & D.

DENVER & SOUTHWESTERN.—The New York Security & Trust Co., successor of the Continental Trust Co., trustee under the general mortgage of 1899, having declared the principal of the bonds due and payable by reason of default of interest, it will, on October 4, sell through Adrian H. Muller & Son, auctioneers, at 161 Broadway, New York, the securities covered by the mortgage in accordance with the plan of organization under which nearly all of the general mortgage bonds have been deposited.

INDIANAPOLIS SOUTHERN.—This company has sold the entire issue of \$5,000,000 of bonds to New York bankers, which makes it possible for the immediate completion of the line now being built between Indianapolis and Switz City, Ind. D. M. Parry is President of the road.

INTERBOROUGH RAPID TRANSIT (NEW YORK).—This company took possession of the subway road September 1, at which time the Rapid Transit Subway Construction Co. turned it over to the company. The road is practically finished on the west branch as far as 145th street and Broadway, and on the east branch to 142d street and Lenox avenue. Electric trains are in operation for experimental and construction purposes, and October 1 is spoken of as the approximate date when it will be opened to the public.

LEHIGH & LACKAWANNA.—The name of this road has been changed to the Lehigh & Delaware.

METROPOLITAN STREET (NEW YORK).—The annual report of this company for the fiscal year ending June 30 shows gross earnings of \$21,485,006, a decrease of \$64,539. Operating expenses increased \$738,746. The large increase in operating expenses was chiefly due to the severity of the winter and the large amount of snow which the company was compelled to remove from its tracks. A heavy increase is also shown in the accident and claim depart-

ments. After all deductions from income are made, the report shows a deficit for the year of \$1,396,770. The total number of passengers carried was 630,070,850, an increase of about 8,000,000 over last year.

MISSOURI, KANSAS & TEXAS.—A suit has been filed by this road against James Bullet, of the Creek nation, in Indian Territory, to determine the rights of the railroad respecting the lands granted by an act of Congress adopted June 25, 1866. By the terms of the act, a company building a line through Indian Territory was to receive alternate sections of land for a distance of 20 miles on each side of the right of way subject to the extinguishment of the Indian title. The company claims that the government is allotting these sections to the Indians and freedmen in disregard of the intents of this act. The present suit seeks to set aside such transfer as illegal on land amounting to about 3,100,000 acres.

NEW YORK & PORT CHESTER.—The application of this company for a city franchise through the Borough of the Bronx, New York City, was finally rejected on August 31 by the Board of Aldermen by a vote of 41 to 18. In order to obtain further consideration from the Board of Aldermen, the company will have to institute new proceedings.

PENNSYLVANIA.—The report of this company for the month of July shows a decrease in gross earnings on lines directly operated, of \$1,514,300. Operating expenses decreased \$1,028,100, leaving a decrease in net earnings of \$486,200. On the Lines West of Pittsburgh, gross earnings decreased \$323,200, and operating expenses decreased \$606,000, leaving an increase in net earnings of \$282,800. The Philadelphia, Baltimore & Washington shows an increase in net for the month of \$53,800, and the West Jersey & Seashore an increase of \$54,100.

PENNSYLVANIA LINES WEST.—Consolidated mortgage bonds of the Pittsburgh, Cincinnati, Chicago & St. Louis Railway Co. to the amount of \$428,401.27, will be purchased October 1, 1904, at a price not exceeding par. The funds for this purpose will be drawn from the sinking fund of the company and the transfer will be made through the Farmers' Loan & Trust Co., of New York City. Sealed proposals must be in the hands of that company before 3 p.m. Friday, September 30.

RALEIGH & WESTERN.—By a recent decree of the Superior Court of Chatham County, N. C., W. J. Tally has been discharged as receiver of this road and the property has been returned to the custody of the officers. S. A. Henszey, Cumnock, N. C., is General Manager.

SOUTH SIDE ELEVATED (CHICAGO).—A circular has been sent out by the Illinois Trust & Savings Bank Co. to stockholders of the South Side Elevated Railroad offering \$3,000,000 of the new 4½ per cent. bonds at par and interest until September 30. Subscriptions will be received to the extent of one \$1,000 bond for each 35 shares held. A stockholder may subscribe for five bonds payable at once, the bonds to be delivered by October 1.

TOLEDO, WALHONDING VALLEY & OHIO.—First mortgage bonds of this company to the amount of \$39,310 will be purchased from the lowest bidders on October 1, 1904, from funds set aside from the general sinking fund. The price must not exceed par and interest. Sealed proposals must be in the hands of the Farmers' Loan & Trust Co., of New York, before 3 p.m. Friday, September 30, 1904. This company is held under lease by the Pennsylvania Lines West.

WINNIPEG, SELKIRK & LAKE WINNIPEG.—This road was formally opened for traffic on Aug. 26. There was an excursion of prominent citizens of Winnipeg and adjacent places to Selkirk.



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EDITORIAL ANNOUNCEMENTS:

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CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, except in the advertising columns. We give in our editorial columns our own opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.

FRIDAY, SEPTEMBER 9, 1904.

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